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Victor W. Sauer, Director of Public Works, Road Commissioner and Surveyor of Contra Costa County, California. More on page

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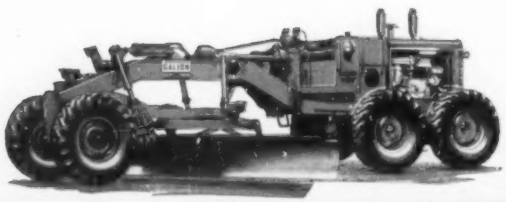

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GRADE-O-MATIC Drive utilizes a torque converter with tail shaft governor and power-shift transmission, in combination with correct balance of grader weight and power to produce most "push-power" at the blade. No foot clutch or gear shift lever. Automatic features simplify operation and provide top-most performance.

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Model T-700 . . . . . 190 h.p., 40,125 lbs.
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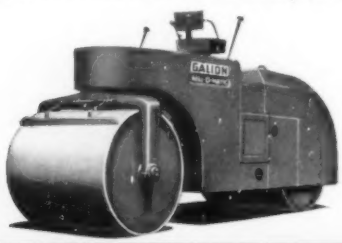

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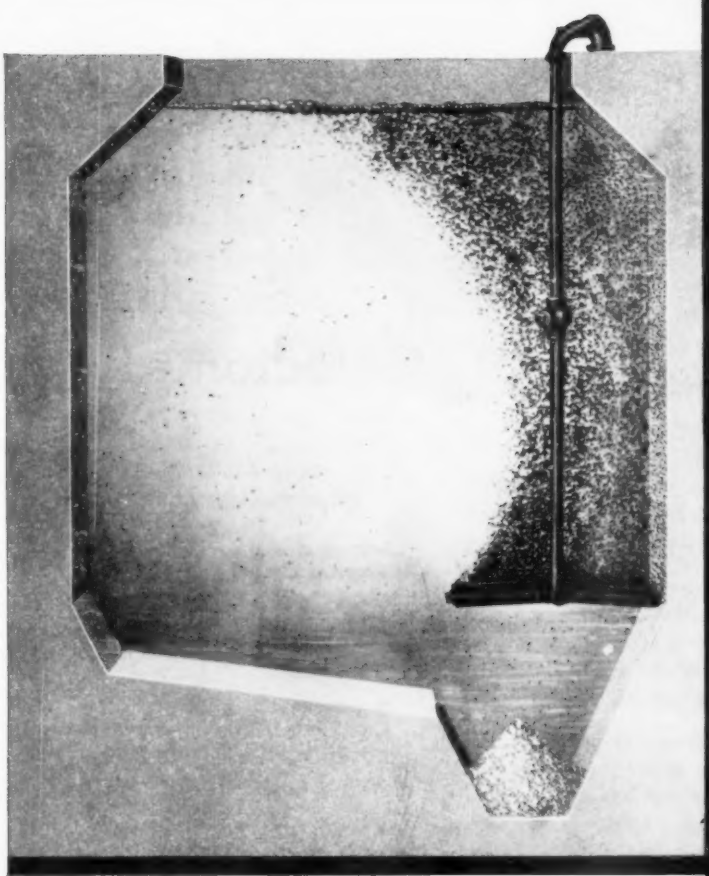
AER-DEGRITTER*

Air Controlled Settling Velocities Independent of Flow



The principle of air controlled velocities was first demonstrated in sewage treatment plants designed by the office of Charles H. Hurd, Consulting Engineer. The Hurd method, using diffuser plates located behind the hopper, was an improvement over the then practiced means of controlling grit tank velocities. The Aer-Degritter* using diffuser tubes located directly above the hopper is, in turn, an improvement on the Hurd method.

The Aer-Degritter* removes grit and sand from sewage through the use of air to effect a controlled velocity of the sewage in the grit tank. The method provides a quiescent zone beneath the air diffusion media to effect a selective deposition of clean grit without organics. There is no need for separate grit washing tanks. Washing and deposition are effected in a single tank.

POINTS OF SUPERIORITY OF THE AER-DEGRITTER*

1. Relative location of grit hopper and air diffusers. In the Aer-Degritter* the diffusers are elevated above the tank floor and the grit hopper is directly beneath the air diffusers. This permits greater flexibility of control of tank bottom velocities regardless of volume of sewage flow. It is these bottom velocities that control the deposition of clean grit and fine sand without also depositing organic material. Tests made on grit removed by Aer-Degritters* have consistently shown less than 0.05% putrescibles.

2. The equipment used to introduce air to the sewage. The use of Swing Diffusers and Precision Diffuser Tubes permits easy access to the grit hopper and cleaning of the diffuser media without taking the tank out of service.

*The application of the equipment, as well as the equipment itself is covered by U.S. Patents No. 2,532,457, No. 2,144,385, No. 2,328,655 and No. 2,555,201.

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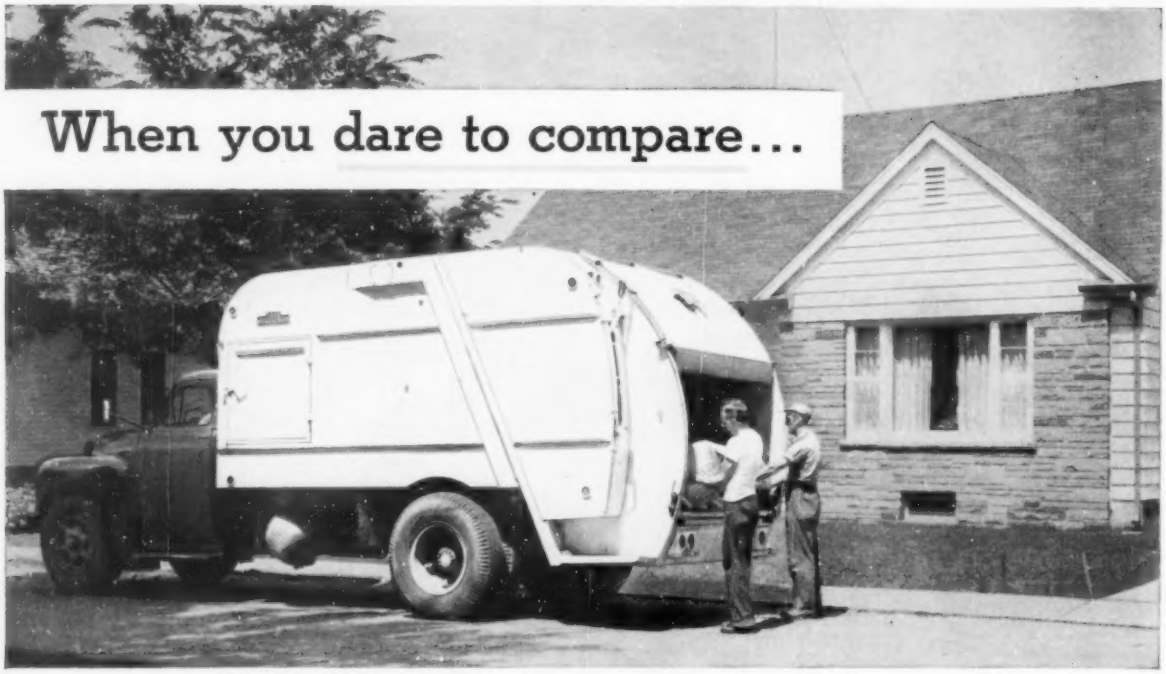
When you dare to compare...



The choice is HEIL Colectomatic

Get all the facts and then decide.

That's the way to buy any municipal equipment. When you are considering refuse collection units, put a Heil Colectomatic to work against any others and here's what you'll discover.

YOU WILL PICK UP BIGGER LOADS . . . and here's why. The packing plate in a Colectomatic is located high in the hopper for better leverage. It exerts a stronger packing action through horizontal thrust, compacts more material into the body. And bigger loads mean fewer trips, better service, lower costs.

YOU WILL PICK UP MORE LOADS . . . because the loading cycle is fast, safe and simple. A touch of a lever starts the cycle. Twin hydraulic cylinders close the safety door and raise the hopper. These same hydraulic rams power the packer blade which sweeps the load out of the hopper and compresses it into the body. In just 23 short seconds you're ready for another load.

There is simply no substitute for performance that delivers the most refuse hauled per working day. But a Heil Colectomatic offers still more advantages: greater employee safety . . . freedom from jamming . . . maneuverability on the route . . . low upkeep and simple adjustments.

Why not get the facts by comparing a Heil Colectomatic to others the next time you're considering better refuse collection for your community. Your Heil distributor will be glad to demonstrate.

HERE ARE STILL MORE COLECTOMATIC ADVANTAGES

- **Quiet Operation**
  No clanking chains, minimum truck engine acceleration noise during loading.
- **Easy Loading**
  Low, wide sill permits two men to load side by side.
- **Simplified Service**
  All lube points can be reached through panel door on each side of body.
- **Fast Dumping**
  Flat floor and obstruction-free tapered body provide quick, clean dumps. Load distribution on axles provides good stability while dumping.
- **Safety**
  Loading-packing mechanism is completely enclosed and a safety door protects personnel from flying debris.
- **Compact body**
  You can maneuver easily in tight alleys and other narrow, restricted areas.

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Published Monthly by Public Works Journal Corporation. Office of Publication at Orange, Conn. Editorial and Advertising offices at 200 So. Broad St., Ridgewood, New Jersey. Subscription rates: U.S.A. and possessions, $5.00. Canada and South America, $6.00. All other countries, $7.00. Accepted as controlled circulation publication at Orange, Conn.

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PUBLIC WORKS MAGAZINE

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THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES- COUNTIES AND STATES

Chicago uncorks massive traffic bottle-neck in only 47 working days with Asphaltic concrete

Foster Avenue (off left at bottom of picture) used to be the downtown terminus of Chicago's famed Lake Shore Drive.

Then vehicle density topped 60,000 per day. Jams grew monumental. So did tempers.

To relieve the situation, Cook County engineers built the double-access, 8-lane 5,000-foot extension shown.

For durability, modern smooth-riding qualities and, above all, speed of construction, they paved with Asphaltic concrete . . . 4½" over an 8" crushed stone base.

This huge paving job was done in only 47 days. Next day, a month ahead of schedule traffic purred contentedly over the smooth-riding Asphalt surface.

Modern city traffic demands modern Asphalt pavement. It goes down quickly and at low cost. It's versatile, long-lasting, easy to maintain. Speeds snow and ice removal. Unharmed by de-icing salts.

Use modern Asphalt pavements to uncork your city's traffic bottlenecks.

"Choice of Asphalt well-advised," says William J. Mortimer, Supt. of Highways, Cook County, Illinois.

"The short paving period, plus the fact that the pavement was opened to traffic immediately, was evidence that the choice of Asphalt was well-advised. Now in use almost three years under heavy-traffic conditions, the road has maintained its original contour."

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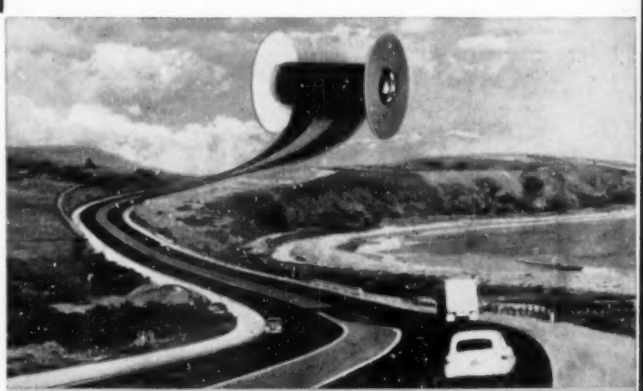
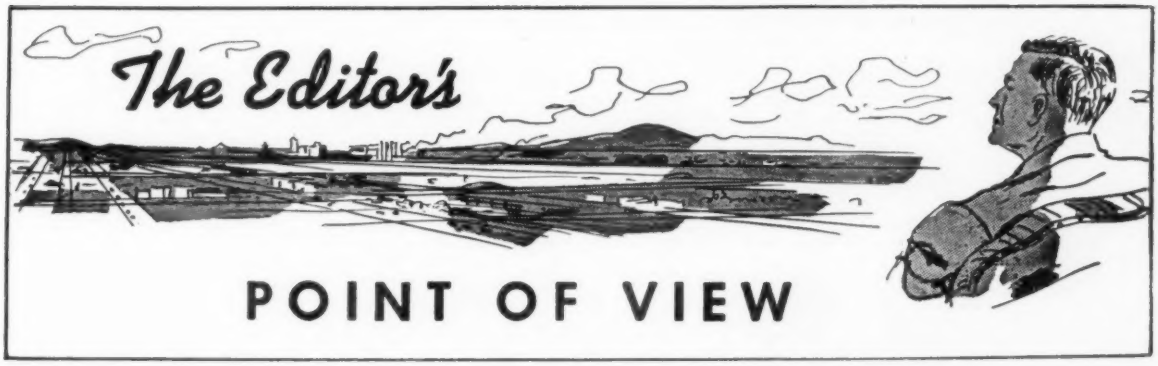


Ribbons of velvet smoothness . . .
MODERN **ASPHALT** HIGHWAYS



Finding Engineers for the Big Highway Program

INDICATIONS are that finding engineers for the proper handling of the proposed Interstate System of highways will be more difficult than finding money, materials or equipment. What this means, in actuality, is that the water works field, the sewerage field, municipalities, counties and state health departments are going to lose a lot of engineers. These folks may be feeling satisfied over the fact that they do not have the headaches incident to planning and constructing such a gigantic program; but many of them will find their former engineers—the ones they have right now—welcoming the challenge and becoming highway engineers. If this does not happen overnight, it will, just as soon as the law of demand and supply raises the salaries of the highway engineers.

Cities, counties and states should begin action right now to give their engineers adequate salaries; or, if that is too much to expect, at least they ought to get them a couple of good raises. If this isn't done, there will be an increasing shortage of engineers in the public works field. There are just so many engineers, not enough, at best; and it will be quite a while before we get many more. It is better to hold on to the ones we now have. A prompt review of the payroll is in order if this is to be done.

Qualified Operation is Needed as Well as Construction

LEST there be some feeling of complacency that our water pollution problems are well on the road to being solved with the recent Federal action of providing grants-in-aid for the construction of sewage treatment plants, a reminder is in order that we also need to provide the technical ability to assure the functioning of those plants. We have had Federal money for plant construction before, with permanent improvement accruing in many cases; but also, in many cases, expensive works were permitted to deteriorate through lack of maintenance or were not operated because no one cared. Some consulting engineers are anxious to see that the works they design function as intended and make a real effort to leave the facilities in competent hands. While this is a procedure that should be followed by all engineers, the municipalities and regulatory authorities share in the responsibility.

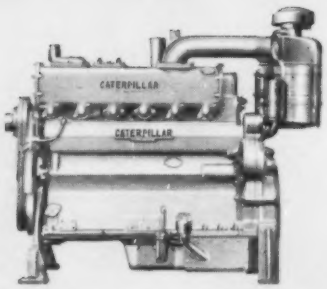
Yet none of these can get the job done if the technical manpower is lacking. Art Robinson, Public Information Officer of the Ohio Water Pollution Control Board, recently pointed out that there are only 300 certified sewage treatment plant operators in Ohio, which, at the present rate of construction of new facilities, would mean there is only one man for each $1,000,000 worth of equipment and facilities. Some states have certification programs for operators; many have training projects which can be geared to produce qualified operators as they are required—maybe. These should be used to the best advantage, and those areas without such means should take steps to acquire them, so that when new plants are built they can be made to do the job for which they were intended.

Today We Finish Construction: Tomorrow We Start Maintenance

WHATEVER is built requires maintenance, and starting right away, not at some distant future date. We have many miles of roads that need maintenance and soon we will have many more. Now is the time to begin to plan the maintenance so essential if the roads we have now and the ones we are planning and building are to give adequate service.

Men, methods and machinery—all are essential in maintenance, but men the most important. States and counties, especially, should begin now to build up their maintenance personnel, putting enough pressure of responsibility on the younger group to separate the men from the boys. Also, manuals of methods and procedures should be developed which are clear and unequivocal. Equipment should be purchased, studied, tested and put into use so men and organizations will be familiar with possibilites and values.

One thing is certain; the old methods will no longer do. Modern equipment is necessary and road design should provide for its effective use through cooperation and exchange of knowledge between design and maintenance offices. Through intelligent design and modern mechanical equipment, maintenance costs can be reduced.



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The introduction of mobile diesel power was a tremendous advance in many fields. It provided efficient diesel power for tractors, motor graders, earthmoving equipment . . . for the work boat, the gin, the locomotive, the oil rig, the municipal plant . . . for *any* application in which steady, low-cost power is crucial. And everywhere, CAT* Diesel Engines proved themselves durable and dependable. They established Caterpillar as the leader in diesel engineering.

Today, hundreds of thousands of modern heavy-duty Cat Diesels are on the job in every corner of the world. And still the research continues. Study and experiment go ahead constantly in Caterpillar laboratories. Special testing machines help point the way toward new advances. Manufacturing techniques improve, too, in the world's largest diesel engine factory—where the quality of workmanship is the standard for the industry.

A modern world must have modern power—more and more of it. It is coming, in ever increasing quantity, from the production lines of Caterpillar, the leader.

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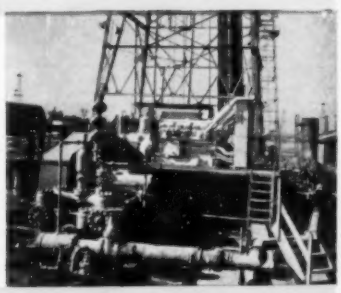
DIESEL POWER FOR PROGRESS



DIESEL LEADERSHIP

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—interchangeable, adjustment-free fuel injection equipment

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—the capsule-type injection valve

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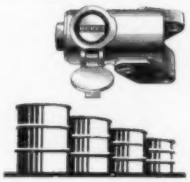
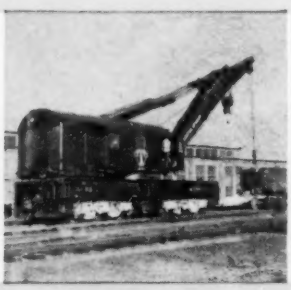
—the service meter

A CATERPILLAR FIRST
—superior lubricants (detergent oils)

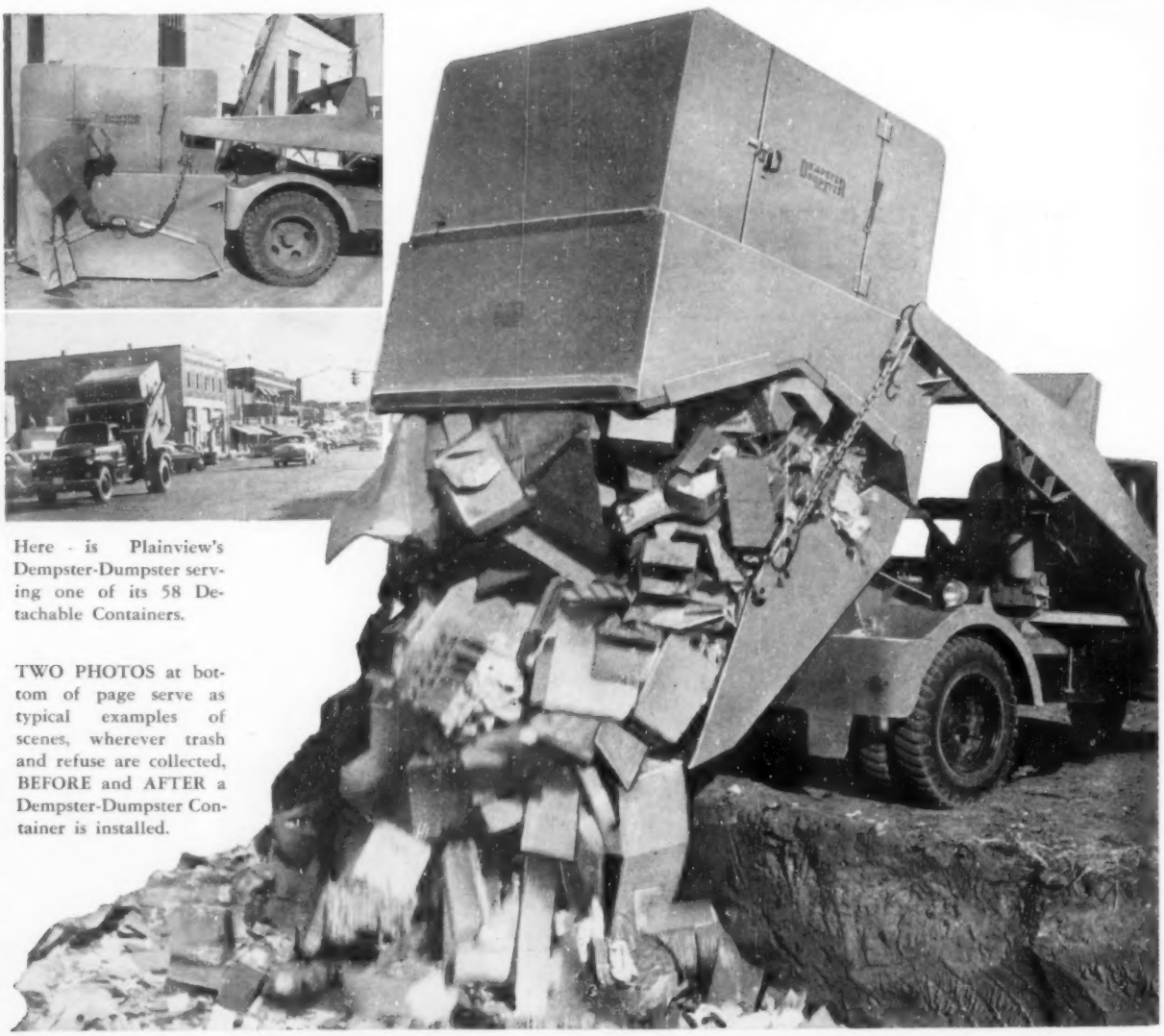


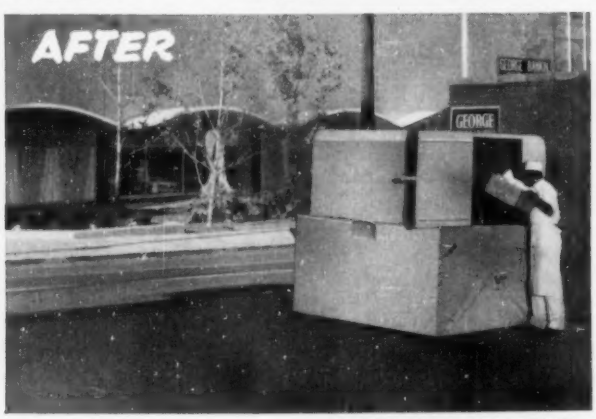


Look what's happening

Here is Plainview's Dempster-Dumpster serving one of its 58 Detachable Containers.

TWO PHOTOS at bottom of page serve as typical examples of scenes, wherever trash and refuse are collected, BEFORE and AFTER a Dempster-Dumpster Container is installed.





DEMPSTER

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to bulk refuse collection!

Cities, large and small, installing Dempster-Dumpster System featuring large capacity fire-proof, scavenger-proof steel Detachable Containers. Scores of them handled by only one man . . . cutting cost tremendously!

THERE IS A WAY to eliminate your bulk refuse handling problem . . . open cans, crates and boxes with overflowing refuse . . . rats feeding on it . . . wind scattering loose rubbish . . . dogs and cats munching in the mess . . . flies buzzing around the stuff—a costly potential in disease and fire hazards alone in damage to persons and property. And, the equipment and labor cost of collection is tremendous. There's a simple, economical and nationally recognized solution to this problem. Big steel Dempster-Dumpster Containers located at convenient bulk refuse accumulation points—each equivalent to 75 ordinary trash cans—in your business areas . . . in housing and apartment areas . . . at schools, hospitals, etc. Scores of them—25, 30, 40, 50—served on schedule by only one man, the driver of your truck-mounted Dempster-Dumpster.

You can understand why officials like Mayor Abernethy of Plainview say: "I don't see how any city can afford to be without this efficient system." Praiseworthy satisfaction is the result in other cities—Borger, Pampa, Odessa and Lubbock in Texas, for instance. Atlanta . . . Baltimore . . . Davenport, Iowa . . . Henderson, Ky. . . . Jackson, Tenn. . . . Lakeland, Fla. . . . Wilmington, N. C. . . . Richmond, Va. . . . Rochester . . . New York City . . . Denver . . . Montgomery, Ala. . . . Wyandotte, Michigan and many, many others.

Invariably, wherever this system is installed, one finds immediate praise of an outstanding improvement from merchant users and citizens alike. Without question, the Dempster-Dumpster System is recognized as the most sanitary and lowest cost method of bulk refuse collection ever devised. Ask us to send you complete information. Write today! Manufactured exclusively by Dempster Brothers, Inc.

"How can any city do without it --" says Plainview's Mayor Abernethy.

Wherever the Dempster-Dumpster System is in use, satisfaction beyond that anticipated is the same as expressed here by Mayor Abernethy. Your city, too, can save thousands of dollars and, at the same time, eliminate fire and health hazards and improve the cleanliness and appearance of your heavy producing districts with this amazing system. A survey of your bulk refuse collection may be arranged without obligation.

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MAYOR

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CITY OF PLAINVIEW
MUNICIPAL OWNED - WATER AND SEWER

PLAINVIEW, TEXAS

Mr. Sid Patterson
Dempster-Dumpster Distributor
Norman, Oklahoma

September 1, 1955

Dear Mr. Patterson:

Please call at your earliest convenience to make another survey to determine how many additional containers we need to serve our remaining heavy trash and garbage accumulation areas. Our City Council feels that our Dempster-Dumpster System has given us far more satisfaction than we had anticipated, and should be expanded.

We are now handling 58 Dempster-Dumpster Containers with one Dempster-Dumpster and will probably need an additional unit with further expansion.

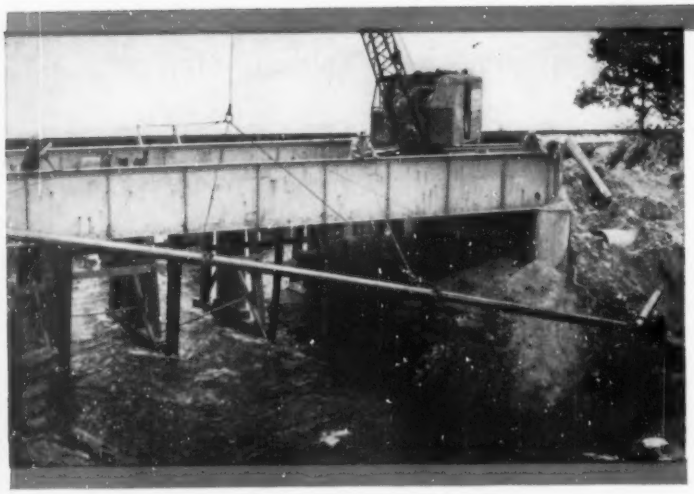
The acceptance of this new method of trash collection and disposal has been outstanding among our merchants. Even the average citizen has noticed and complimented the City Officials on the great improvement in the cleanliness of our alleys and streets since the System was installed in December, 1954.

I don't see how any city can afford to be without this efficient system. We have found, as your original survey pointed out, that the labor savings alone will amortize the cost of the Dempster-Dumpster System within the first three years of its operation.

Yours very truly,
C. L. Abernethy
C. L. Abernethy

BROTHERS 9116 Dempster Bldg., Knoxville 17, Tennessee

When you use it



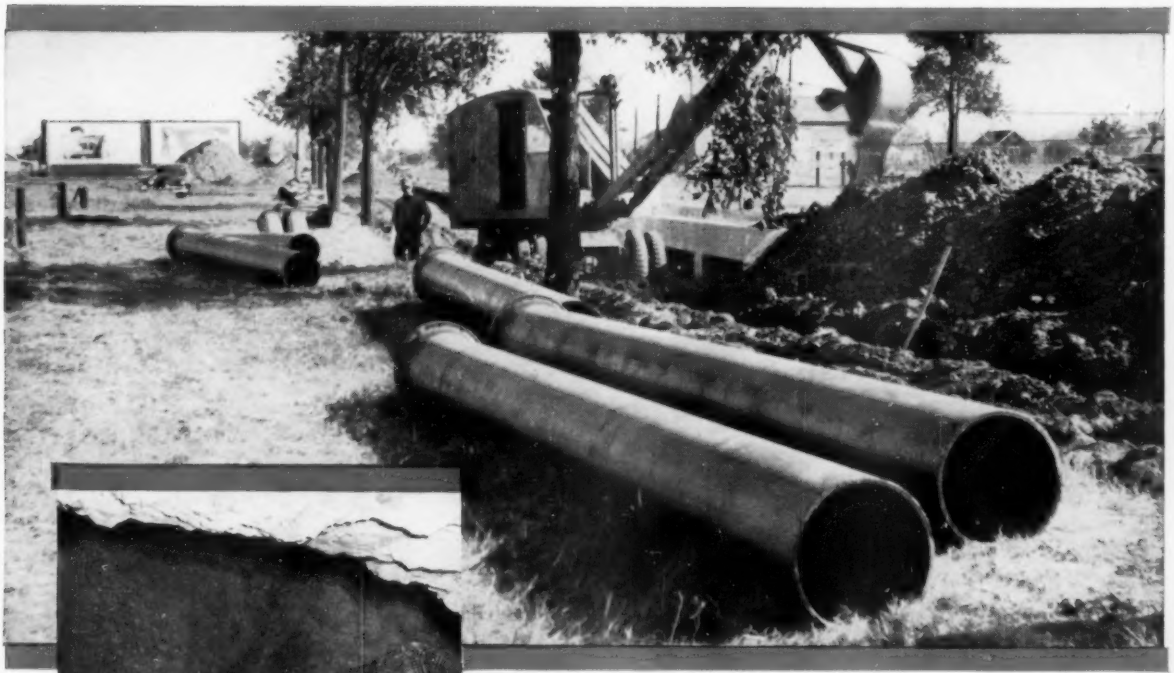
Installing 6-inch Mechanical Joint cast iron pipe for pressure sewer river crossing to sewage treatment plant at Marquette, Mich.

If you were to put *your own money* in a pipeline that should be as nearly permanent as brains, hands and machines could make it, what pipe would you buy? Cast Iron Pipe, undoubtedly! And why? Because cast iron mains are in their *second century* of service in nearly *seventy* cities. *Modernized* cast iron pipe, as made today, is even tougher and stronger. Since everybody pays taxes, one way or another, everybody benefits when you install long-lived cast iron pipe. For further information, write Cast Iron Pipe Research Association, 122 So. Michigan Avenue, Chicago 3.

About four miles of 16-inch Mechanical Joint cast iron pipe being installed for water line at Orlando, Florida.

CAST IRON PIPE

everybody benefits!



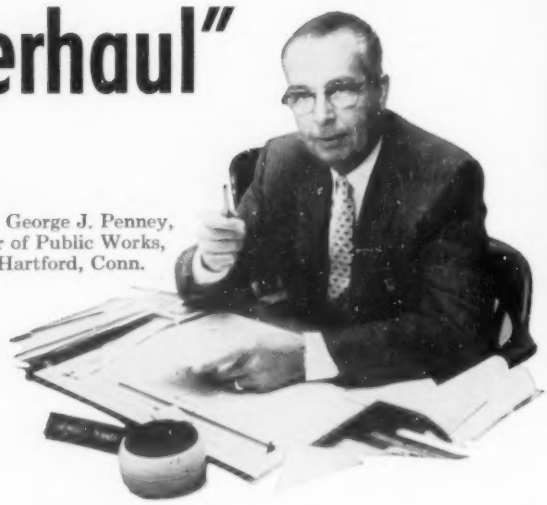
Laying 16-inch cast iron pipe for water line to new Caterpillar Tractor Company plant at Decatur, Illinois.

Tieing-in 16" Cement-lined cast iron feeder main with 133-year old cast iron water main in Philadelphia.

Laying 21,000 feet of 6" to 12" cast iron pipe for water main extension at North Brunswick Township, N. J.

SERVES FOR CENTURIES...

"Our Ford Trucks average 120,000 engine miles without a major overhaul"



says Mr. George J. Penney,
Director of Public Works,
East Hartford, Conn.

"We've been using Ford trucks for 36 years," says Mr. Penney. "Four out of every five of our trucks are Fords—and we have them in every department. We have found that the interchangeability of parts possible with our Ford trucks, together with the uniformity of maintenance and repair procedures, results in substantial savings. They really keep costs down.

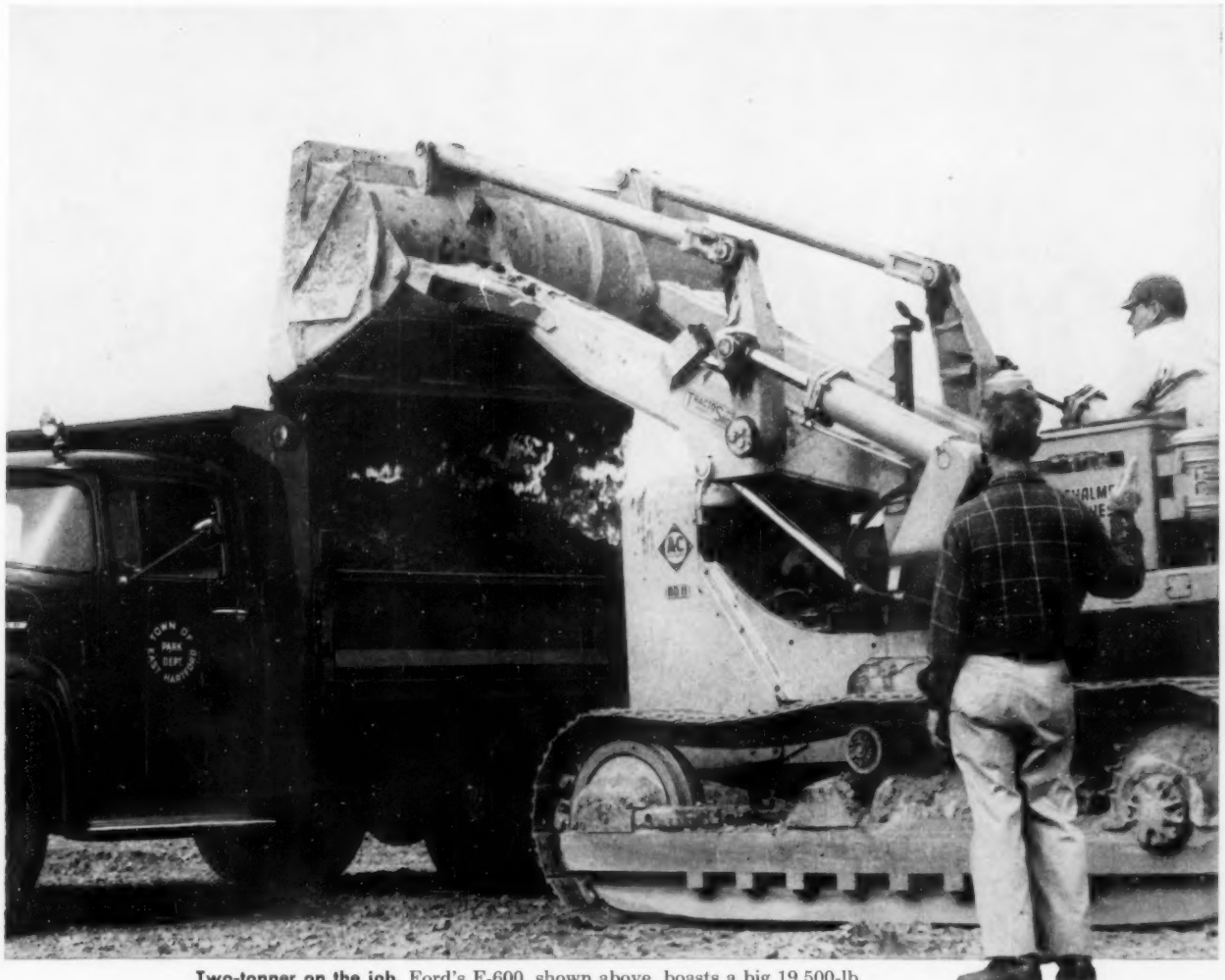
"We have run our Fords for as long as five years without a major overhaul. In fact, we operated one veteran 1948 Ford F-800 for *seven* years without ever taking the head off.

"Our present policy is to turn them in every three years. During that time a truck chalks up about 40,000 road miles. This amounts to about 120,000 engine miles because of the extensive use of the power take-off. We never have to give these Fords an engine overhaul."

It will pay *you* to look at Ford trucks for your operation, too. Look at Ford's many money-saving features. Ford-pioneered Short Stroke engine design reduces engine wear, steps up efficiency, gives you more usable power with far greater gas savings. Sodium-cooled exhaust valves on heavy-duty engines run up to 225° cooler, last far longer than ordinary valves.

Big 12-volt ignition system gives more positive combustion, quicker starts. New, stronger chassis make Ford trucks last longer out on the job. And remember, Ford's resale value is traditionally high.

From pickups to 65,000-lb. GVW BIG JOBS, the Big Fleets are going Ford. So take a tip from the men who really *know* trucks. See your Ford Dealer *today*.



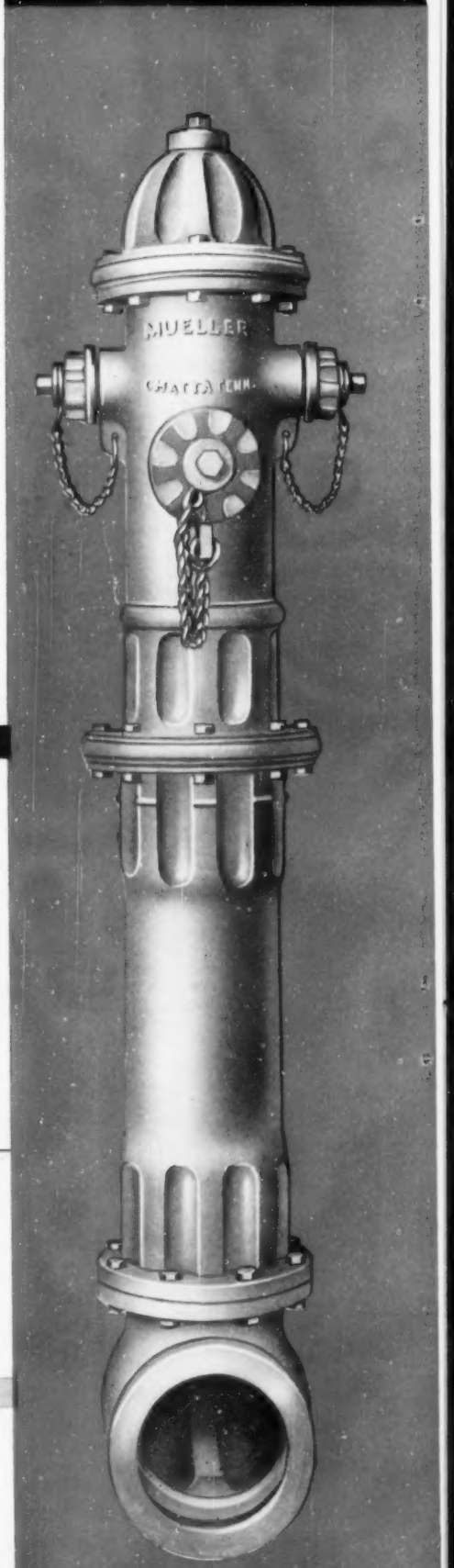
Two-tonner on the job. Ford's F-600, shown above, boasts a big 19,500-lb. GVW for payloads over seven tons. There's a choice of engines, too—a six and three V-8's—every one with Ford-pioneered Short Stroke design!

Special bodies like this sanitation truck above, can be economically mounted on the '56 Ford F-800. Choice of 5 wheelbases—from 132- to 192-in.—lets you mount bodies from 7½ to 19 ft. long. New 25,000-lb. GVW carries payloads up to 18,445 lb.

Tough road jobs are performed with ease by this F-600 dump truck. Exclusive Lifeguard features and Driverized cab add safety and comfort to long, dependable performance.

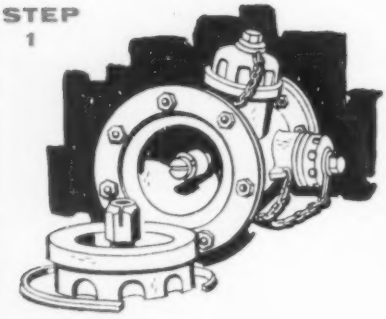
FORD TRUCKS COST LESS ...less to own...less to run...last longer, too!

Always Ready



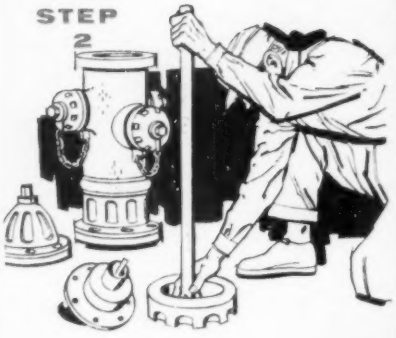
FOLLOW THESE SIMPLE STEPS

STEP 1



Remove broken safety flange from upper barrel section of hydrant. Remove damaged stem coupling and sleeve. Remove bonnet assembly, stuffing box and stem from upper barrel. (NOTE: Before sliding stem out of stuffing box, slip A-24099 brass sleeve over threads to prevent "O" ring damage.)

STEP 2



Screw new safety stem coupling down against shoulder on lower stem. Slip safety sleeve over lower end of upper stem section. Screw upper stem into safety stem coupling until it bottoms against lower stem.

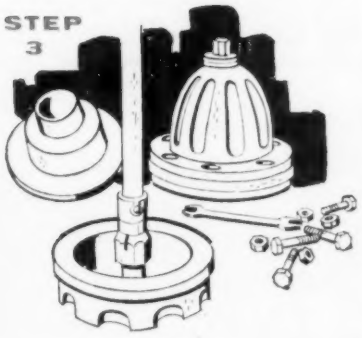
Contact your Mueller Representative or write direct for complete details.

MUELLER®
improved fire hydrant

Designed to withstand the most adverse weather conditions, the Mueller AWWA Improved Fire Hydrant is ready for instant use for emergencies.
Large bronze weather cap prevents freezing of operating nut.
Dry top design keeps water away from threads and bearing surfaces.
"O" ring stem seals provide perfect watertight seal and hold oil in reservoir, keeping threads lubricated. Safety stem coupling and flange provide simple, fast repair in case of traffic damage.
Above ground maintenance makes it a simple matter to keep the Mueller Improved Fire Hydrant in an "always ready" condition.

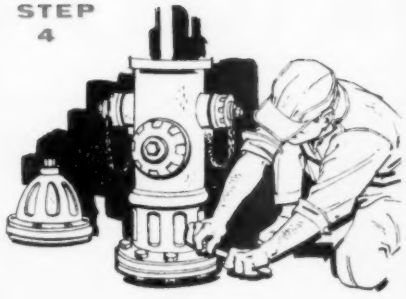
FOR REPAIR AFTER TRAFFIC DAMAGE

STEP 3



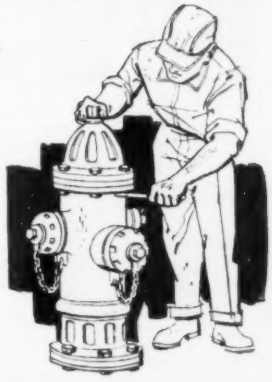
Align slot in safety stem coupling with tongue and groove in stems. Screw coupling upward until tongue and groove of stems lock firmly together. Drop safety sleeve down over upper end of coupling and tighten setscrew in sleeve.

STEP 4



Install flange gasket on lower barrel – position upper barrel making sure gasket remains centered. Bolt the two halves of the safety flange in place with circular groove facing upward. Make sure safety flange fits lower barrel snugly.

STEP 5

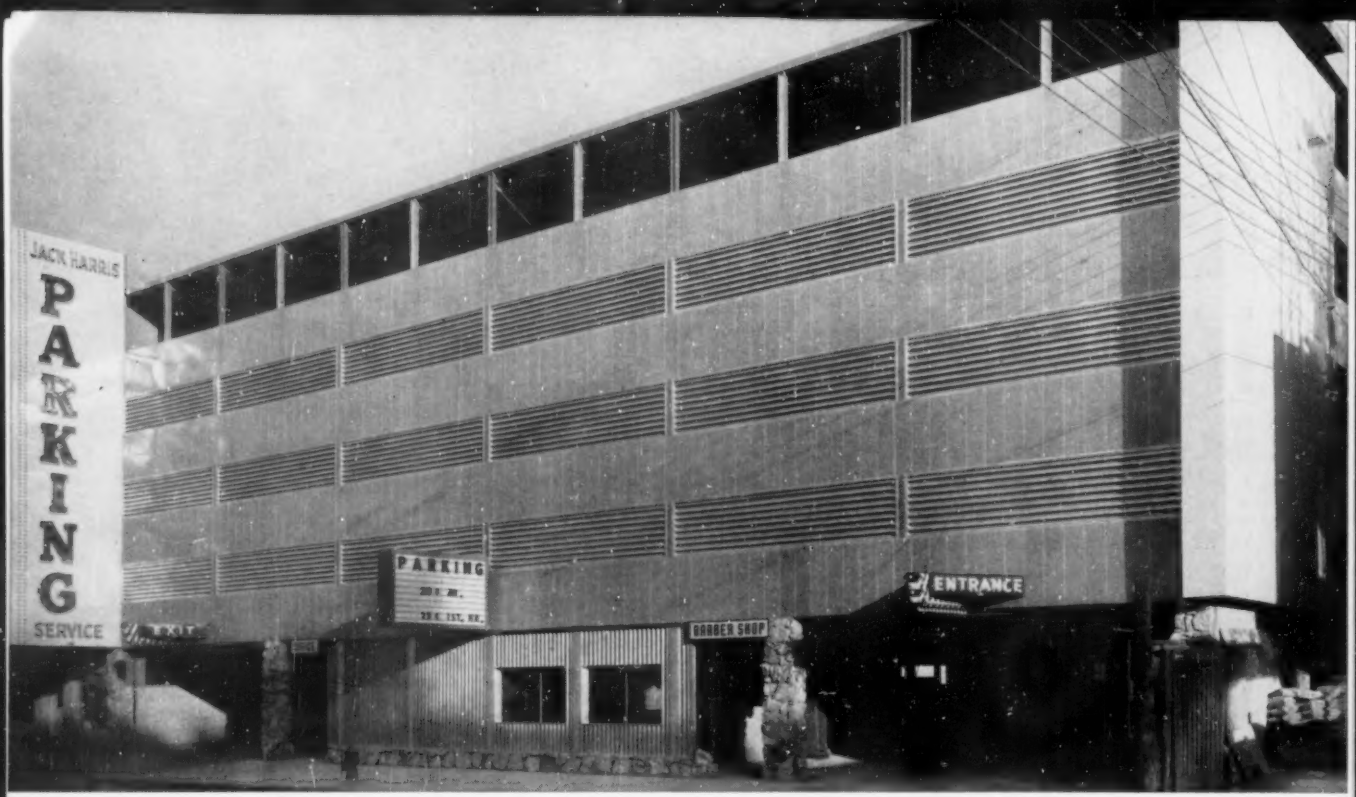


Slide stuffing box over brass sleeve on stem threads. Position stuffing box plate and bolt to barrel. Remove brass sleeve. Fill oil reservoir and replace bonnet. Turn operating nut clockwise to engage stem. Position filler plug over oil reservoir and bolt bonnet to barrel. Repair is now complete.

MUELLER CO.

Dependable Since 1857

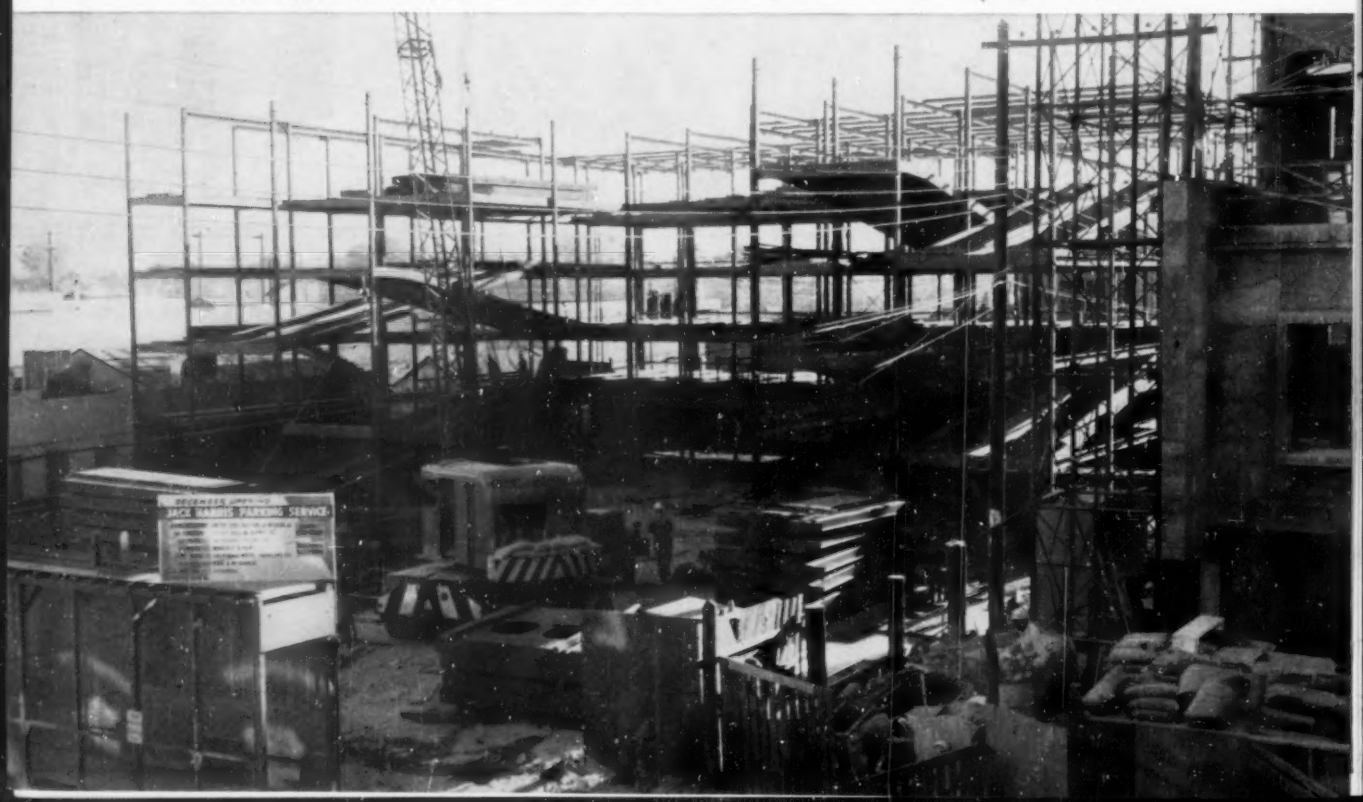
MAIN OFFICE & FACTORY DECATUR, ILLINOIS

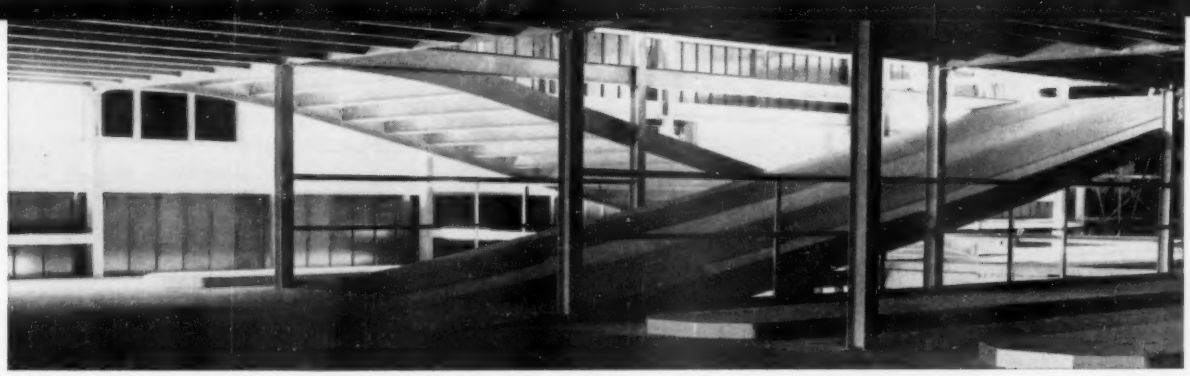


THE JACK HARRIS PARKING SERVICE. *Architect:* Walter Zick and Harris Sharp, Las Vegas, Nevada. *Consulting Engineer — Contractor:* Ellis E. White Company, Engineering-Contracting, Park-on Structures, Beverly Hills, Cal.

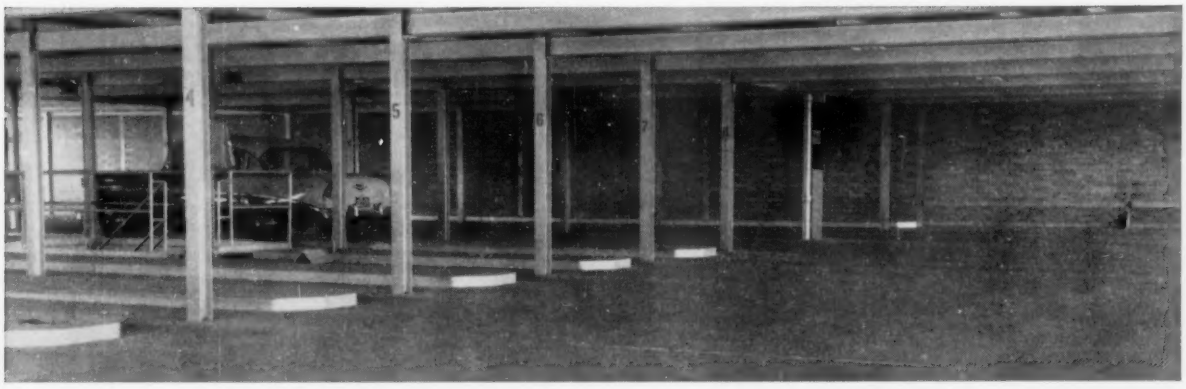
How Jack Harris *saved*

STRUCTURAL FRAMEWORK DURING ERECTION. The modular constructed building consists of five basic parts: steel columns, floor beams, parking panels, walkway panels, and aisle panels. Can be rearranged to fit almost any size rectangular or square lot.





INTERIOR. Ramps are surfaced with expanded steel grids for better traction.



PARKING AREA—FIFTH FLOOR. Flooring is prefabricated. Formed steel floor panels are joined to Structural Steel channel and I-beam floor supports, and are covered with USS Multigrip Floor Plate.

money in Las Vegas

This is the Jack Harris Parking Service, a five-floor, 300-car parking structure, located in the golden heart of Las Vegas.

The building rests on concrete slab and reinforced concrete footings. But the structural framework, the ramps, the upper four floors, the roof and most of the siding are of STEEL. And that's where Jack Harris saved his money!

Over 500 tons of USS Structural Steel were used in the framing of this building, along with approximately 180 tons of USS Multigrip Floor Plate.

MAN HOURS SAVED? Hundreds of them! Plus the fact that Structural Steel is the *most economical* of load-bearing materials.

VERSATILITY? By all means! Structural Steel can be bolted, riveted or welded, and can be erected in *any weather* in which men can work.

DEPENDABILITY? No doubt about it! Structural Steel is the *strongest* of load-bearing materials—will withstand more abuse than other structural materials, effectively resisting tension, torsion, compression and shear.

MAINTENANCE? Never! Once enclosed in buildings, Structural Steel lasts indefinitely, requiring no maintenance.

QUALITY? Unquestionable! Steel members are fabricated indoors; therefore, weather can have no effect on the quality of the workmanship.

You can save construction dollars, too. Whether your municipal project be parking garages, schools, government buildings, or even airports —you won't find a stronger, safer, more practical construction material than Structural Steel.

USS STRUCTURAL STEEL

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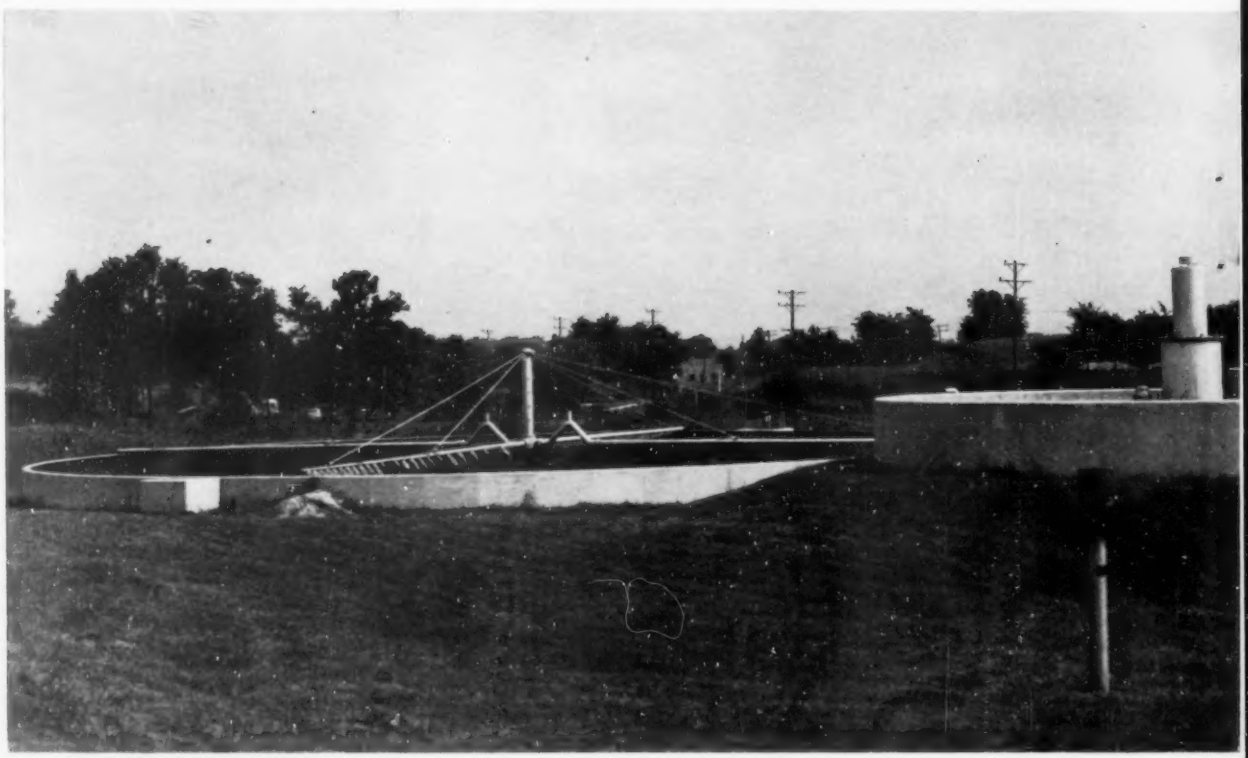

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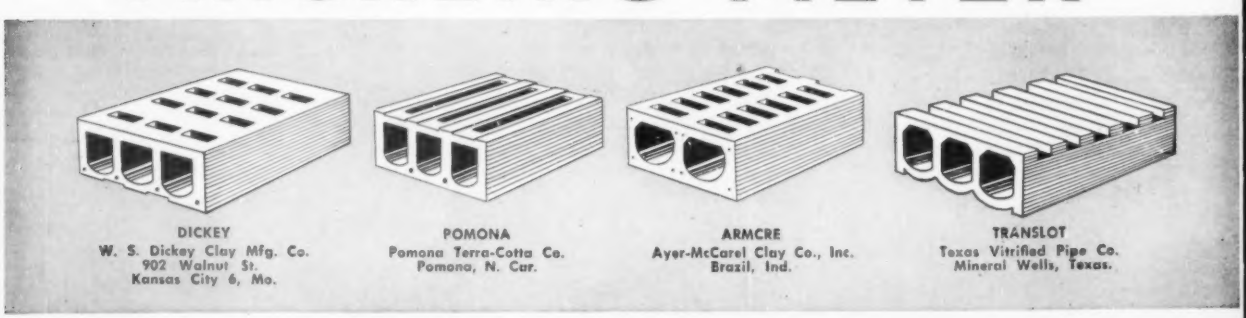
4. GOOD RESULTS—top notch effluent—say 20 ppm BOD, day after day, year after year.
5. RELIABILITY distinguishes their performance always.
6. OVERLOAD IS NO PROBLEM. Take temporary shock loads—or those of a new industry right in their stride.

TRICKLING FILTER



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TRANSLOT
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Mineral Wells, Texas.

Modern trickling filter plant at Pittsfield, Illinois

Consulting Engineers, Warren & Van Praag, Decatur, Illinois.

Contractor, Thomas J. Sheehan, 23rd and Olive Streets, St. Louis, Mo.

Major Equipment, PFT Rotary Distributor for 85′ filter bed; right, 35′ Digester with PFT floating cover. Also, PFT Heater and Heat Exchanger are used.

Trickling Filter Plants

clay bottom blocks

☆ ☆ ☆

Get new TFFI Handbook

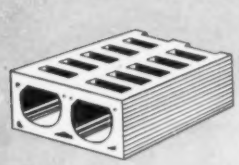
The full illustrated story of

TFFI *vitrified clay filter bottom blocks,* their advantages, efficiencies, and economies is in the new 1954 revised edition of the popular HANDBOOK OF TRICKLING FILTER DESIGN. If you lack a copy, just write any member of the Institute listed below for one. It's free.

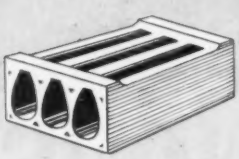
Recommended underdrain Specifications

Standard Specifications for Vitrified Clay Filter Blocks for Trickling Filters are given in full on pages 37 and 38 of the 1954 revised edition of the HANDBOOK OF TRICKLING FILTER DESIGN. These specifications cover types of blocks, compressive strength, absorption, shape, permissible variations, apertures, shell and web thickness, drainage channels, workmanship, markings, testing — everything that an engineer needs to write specifications for trickling filter blocks. Secure your copy from any TFFI member listed below.

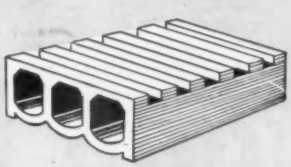
FLOOR INSTITUTE



BOSCO
Bowerston Shale Co.
Bowerston, Ohio



NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



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Symbol of
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Gar Wood-St. Paul dump bodies and hoists can help you handle street maintenance at a lower net cost per payload hour. Gar Wood dump bodies are stress-tested to put strength where it's needed, eliminating excess weight. Strong-Arm hoists are designed for faster, safer dumping . . . smooth hydraulic operation throughout the dumping cycle. Check the complete line!

GAR WOOD INDUSTRIES,

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chose Gar Wood for better refuse collection service!

This year, as in every other year, more municipalities chose Gar Wood collection equipment than any other make! In fact, 1956 has been the biggest year in Load-Packer history, and new Speed-Packers have enjoyed phenomenal acceptance since their introduction last spring.

There are at least 3 important reasons for this overwhelming brand preference. You, as a public official, will be interested in them:

1. ***Gar Wood equipment sets the standard*** for sanitary, low-cost performance. Measure performance any way you like—by sanitation, ease of loading, compaction, complete dumping—you'll find Gar Wood Load-Packers and Speed-Packers way ahead.
2. ***The name Gar Wood means advanced design.*** Load-Packers are the original packing-type sanitary refuse collection bodies. New Gar Wood Speed-Packers are the only continuous loaders that load, crush and compact to give you far greater payloads. And, right now, still another new Gar Wood unit is in the advanced testing stages!
3. ***You can count on lower maintenance costs*** with Gar Wood equipment. Simplified design and rugged construction mean extra long life. All units are fully hydraulic for trouble-free service. And, many Load-Packer and Speed-Packer replacement parts are interchangeable.

Add up these advantages. Then ask your Gar Wood-St. Paul truck equipment distributor for a demonstration on your own routes. You'll see that Gar Wood equipment can help your municipality, like over 2700 others, have better collection service at lower costs!

Gar Wood excavators handle a wide range of excavating and material-handling jobs faster and for less. They're exceptionally easy to convert for use as draglines, trench hoes, shovels, clamshells, cranes, or foundation borers. Also available as a 25-ton truck crane for multi-job mobility. Gar Wood "75" excavators are built and backed by specialists in ¾ yard machines.

Gar Wood-Buckeye ditchers, like the model 407 shown below, are preferred by municipalities for utility work. The 407 is streamlined and compact for work in close quarters. To clear obstructions, you push a button... the conveyor shifts while you keep digging. The complete Buckeye line of ladder and wheel-type ditchers includes a size and type for every municipal application.

INC. Wayne, Michigan

MATTOON, Ill.; RICHMOND, CALIF.

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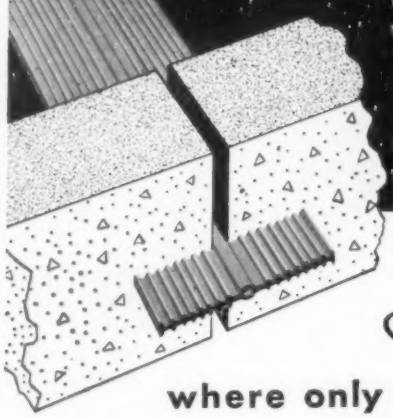
Polyviny'chloride = PVC

WATERSTOPS FOR EXPANSION & CONSTRUCTION JOINTS



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where only the BEST will do!

Architects and engineers the world over are convinced that "DURAJOINT" is a waterstop on which they can successfully stake their reputation. This thermo-plastic waterstop, designed from a specially compounded Polyvinylchloride = PVC, is extruded with a center hollow bulb and longitudinal ribs on both sides that insure the distribution of critical pressures and enhance the holding power. "DURAJOINT'S" adequate elasticity and excellent tear resistance allows it to successfully handle vertical or lateral movements of masses of concrete without being sheared. Specify "DURAJOINT" with the comfort of knowing that this is a waterstop that will, undoubtedly, outlast the usefulness of the structure in which it is used.

ADVANTAGES

- **Resistant to extreme waterhead pressures**
- **Tensile strength of not less than 1900 lbs. per square inch**
- **Superior holding strength . . . elongation ability of more than 350%**
- **Effective temperature range of −54°F. to +176°F.**
- **Chemically inert . . . resistant to acids, alkalis, weather, chlorinated water, oil, fungus, etc.**
- **Quickly, easily spliced "on the job" by merely applying heat and holding the ends together . . . requires no welding or vulcanizing equipment**
- **Available in lightweight, easy to handle 50 ft. coils . . . withstands abuse without damage**

"DURAJOINT" enjoys national distribution through the outlets of Tecon Products Inc. in the 11 western states and W. R. Meadows, Inc. in the other 37 states of the mid-western, southern and eastern portions of the United States. Write today for complete information.

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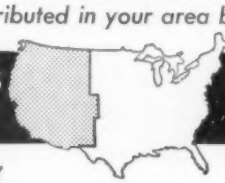

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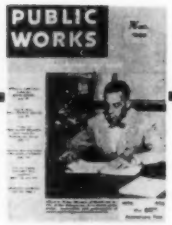

LEADER IN PUBLIC WORKS

★

Victor W. Sauer is Director of the Public Works Department of Contra Costa County, California, serving also as Road Commissioner and Surveyor. He has been with the county since 1952. Prior to that time he had a variety of fine engineering experience. After graduation from the University of California in 1935 with a BSCE degree, Mr. Sauer went to work with the Six Companies of Oakland as a rodman, on the Broadway Tunnel. He worked as draftsman, and later as Assistant Civil Engineer, for Oakland, California, from 1935 to 1943, when he went into the Army. He served as Commanding Officer of a Malaria Control Unit in New Guinea, where malaria control was a real problem, contributing to the program that reduced the malaria rate among US troops from 700 to less than 50 per thousand per year.

On his return from overseas, he resumed his position with Oakland, advancing to Construction Engineer. In 1950 he joined the Contra Costa Sanitary District, later becoming Acting Engineer-Manager, in which position he served until 1952 when he became the first County Road Commissioner.

Mr. Sauer is an Associate Member of the American Society of Civil Engineers and of the Highway Research Board, and a Member of the American Road Builders' Association, the Richmond Engineers Club, the County Engineers Association, the East Bay Engineers Club and the American Legion. He and Mrs. (Lois) Sauer have three children, a boy and two girls, who are 16, 9 and 3 years old.

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Rugged work requires rugged equipment and that's exactly what you get with Wagner "Torture Tested" tractor equipment. Every stress point is *doubly* protected. Heavy-duty construction keeps maintenance costs way down and productive time way up. Wagner equipment stays on the job day in and day out working for you and more profits. No wonder Wagner tractor equipment is recognized as so far superior it has become No. 1 in America by a wide, wide margin. See all the rugged features of Wagner tractor equipment and the numerous attachments that can make a tractor your most versatile piece of equipment. Get proven dependability no matter how tough the job. Get Wagner tractor equipment today.

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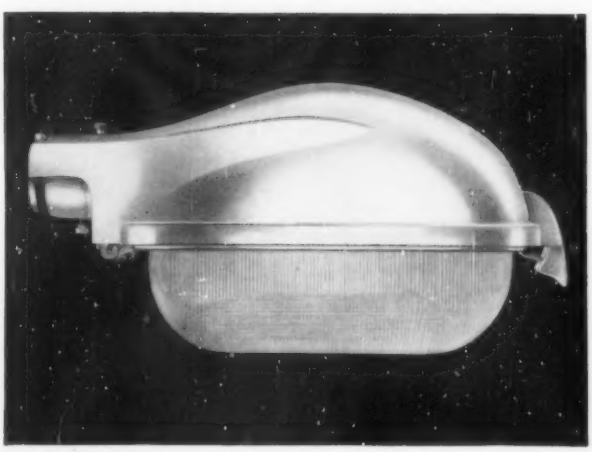
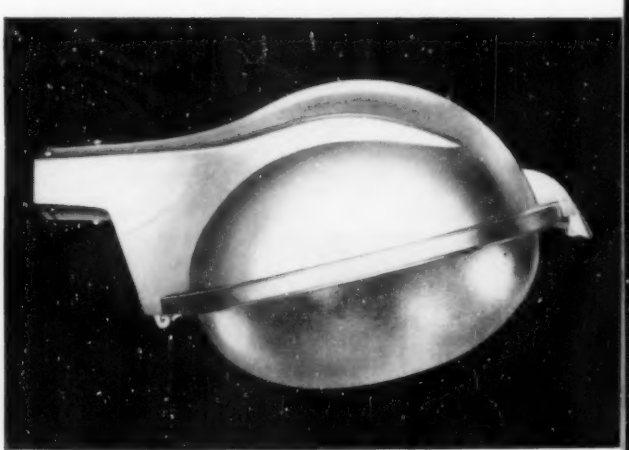
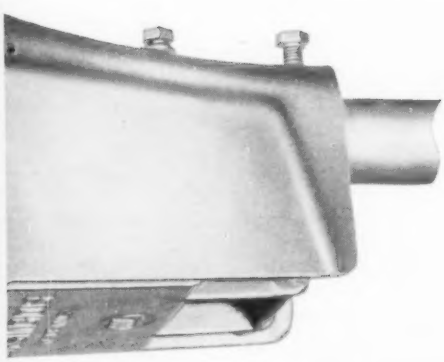


OV-20 uses 11,000-lumen CH-5, 15,000-lumen AH-1, 20,000-lumen EH-1, and 19,000-lumen JH-1 mercury lamps. Type II, III and IV distribution.



OV-60 uses 35,000-lumen AH-18, 33,000-lumen BH-18, 52,000-lumen AH-15, and 49,000-lumen BH-15 lamps. Type IV distribution.



New Westinghouse OV-35

. . . the first luminaire designed specifically for fluorescent mercury lamps

Westinghouse, pioneer in the development of mercury street lighting — the OV-20 and OV-60 — now presents the OV-35 luminaire which can be used with the 400-watt J-H1 or the 700-watt B-H18 fluorescent mercury lamps.

This third member of the Westinghouse mercury group now offers you a complete selection of mercury luminaires for any roadway application — regardless of width or traffic conditions.

The new OV-35 is the first street-lighting luminaire to include a completely sealed optical system — bugs, dirt or moisture cannot get in. Like the OV-20 and the OV-60, this new luminaire assures the best possible night visibility and a greater uniformity of pavement brightness. It inherits their same outstanding plus features, too . . . such as one-piece cast aluminum housing, new optical system, one-hand maintenance, and smooth good looks.

Whatever your roadway lighting requirements, be sure to specify Westinghouse mercury luminaires. More information? See your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio. J-04405-X

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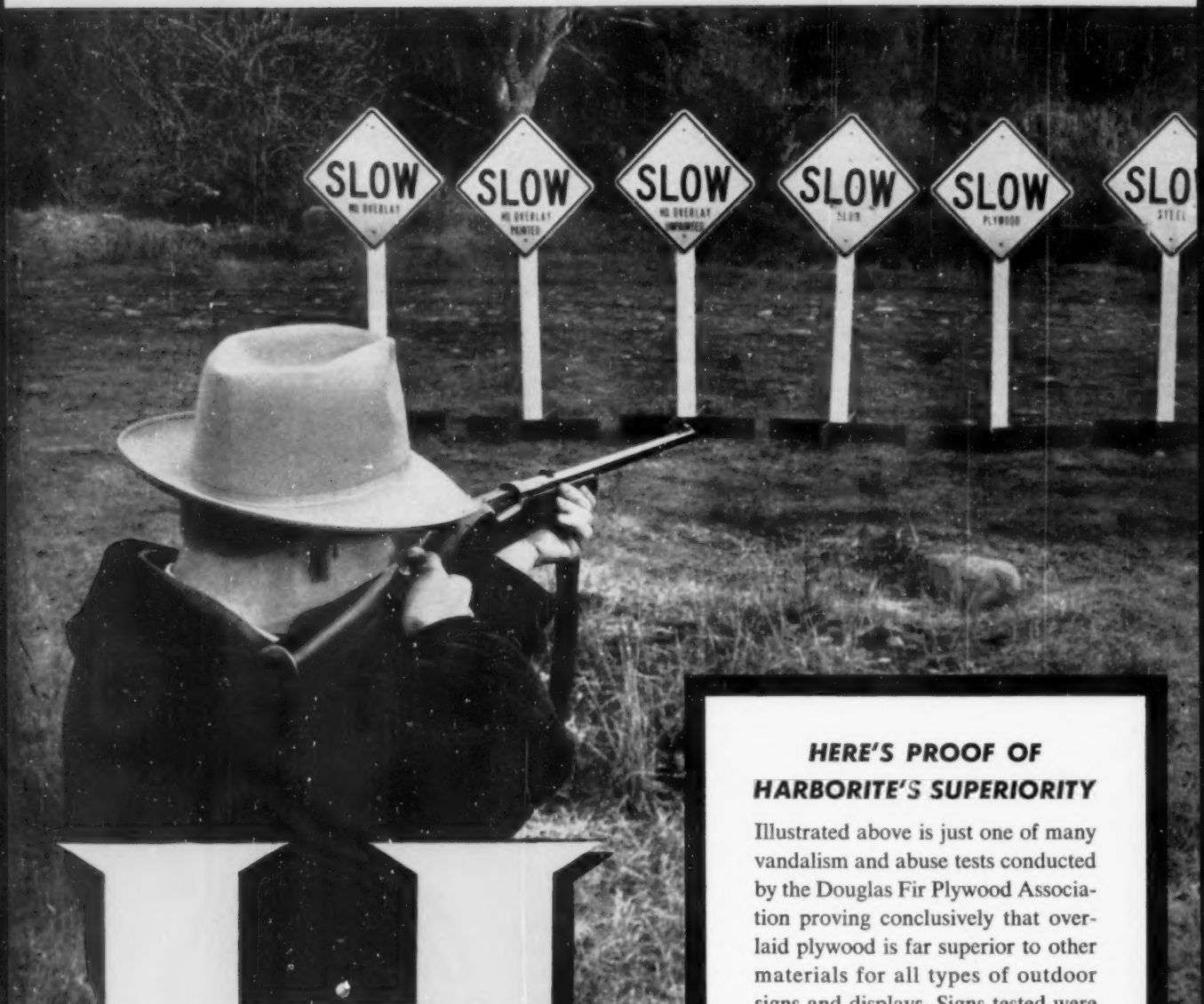

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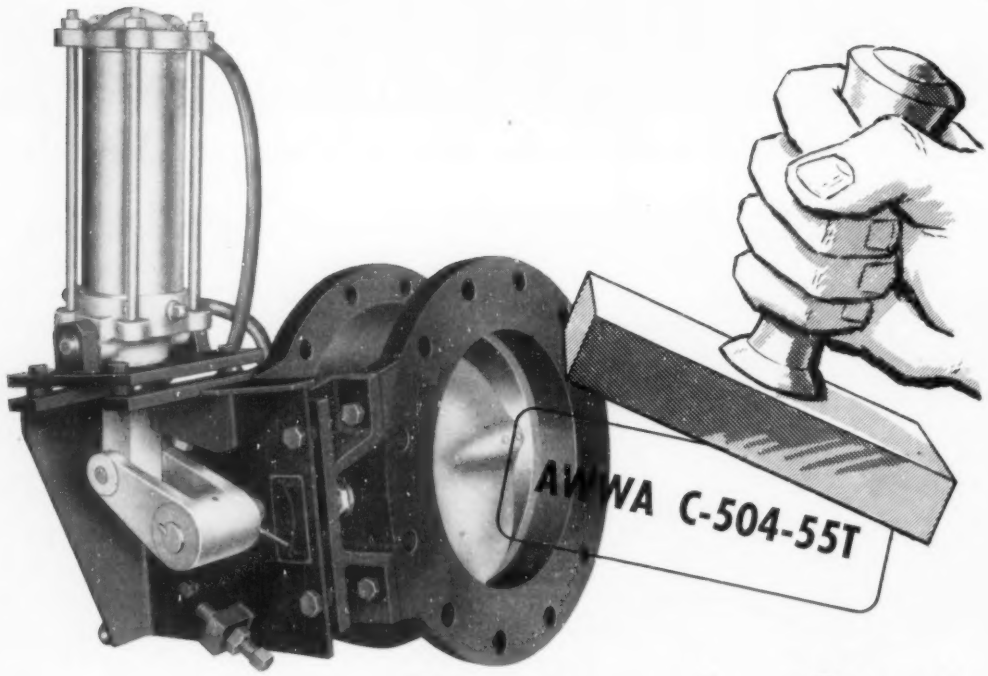

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Complete Industrial Electronics Catalog

558. A 304-page industrial electronics catalog of the latest developments in test instruments, tubes, relays, capacitors, transformers and everything you need in electronics, radio and TV is available from Newark Electric Co., 223 W. Madison St., Chicago 6, Ill. Check the reply card for your free copy.

Ditch-Witch Trenchers For Economical Trenching

559. Features of these lightweight trenchers are hydraulic depth control, bucket line, power feed, replaceable teeth and vertical boom. Check the reply card or write The Charles Machine Works, Perry, Oklahoma, for models, specifications, optional equipment.

Plastix Permanent-Type Reflective Pavement Markers

560. A fully illustrated catalog gives all the facts about Plastix, the permanent-type reflective pavement marking material with a practically unlimited scope of applications—for progressive traffic safety and control programs, for marking airfields, parking facilities, crosswalks and for industrial uses. Write for Catalog PX-56 to Prismo Safety Corp., Huntington, Pa., or check the reply card.

Handbook on Vertical Turbine Pumps

561. A comprehensive handbook, "The Answers to Your Questions About Layne Vertical Turbine Pumps", has been released by Layne & Bowler Inc., Memphis 8, Tenn. It covers the use of pumps for municipalities, industry and irrigation. Check the reply card.

Freyssinet Methods For Prestressed Concrete Construction

562. Wide-flange beams, I-beams, modified wide flange beams, hollow slabs and double tee slabs of prestressed concrete construction are described fully in bulletins available from Freyssinet Co., 57 William St., New York 5, N. Y. These beams and slabs can be used as floor or roof girders and in bridge construction. For design data, loading tables and specifications check the reply card.

Prices and Specifications On Engineers Transits

563. General information on the operation of transits, causes of instrumental errors, cleaning and lubrication and adjustments are covered in available literature. For specifications, prices and ordering write Atlas Instrument Co., 705 Douglas St., Sioux City, Ia., or check the reply card.

Literature on Concrete Vibrators And Attachments For Paving Operations

564. Concrete vibrators powered by Hi-lectric multi-purpose generators and Hi-lectric vibrator attachments for various paving operations including full slab, side form and widening strip are described in literature available from Maginniss Power Tool Co., 154 Distl Ave., Mansfield, Ohio. Check the reply card for specifications and operations of this vibratory equipment.

Armco Flex-Beam Guardrail

565. Corrugated, beam-type, all-steel guard rail that provides safety insurance by warning of danger and protecting if the warning fails is described in literature from Armco Drainage & Metal Products, Inc., General Offices, 11056 Curtis St., Middletown, Ohio. Sectional drawings, installation details and specifications are a few of the sections covered.

Information on Methods of Applying Antifoam Agents

568. An illustrated 4-page bulletin describing different methods of feeding antifoam agents to batch and continuous processes is available from Hodag Chemical Corp., 7247 North Central Park, Chicago, Ill. Application methods include range from simple manual feeders to complex automatic feeding systems. For your copy check the reply card.

Manual of Rubber Seat Butterfly Valves

570. A 40-page manual on rubber seat butterfly valves has been completed by Henry Pratt Co., Inc., 2222 South Halsted St., Chicago 8, Ill. Theory of butterfly valves, design features and dimensions of all standard designs and descriptions and dimensions of basic operator types are fully covered. Check the reply card.

Monotube Overhead Sign Supports For Highway Marking

567. Monotube overhead sign supports for freeways, turnpikes, expressways and general highway use are described fully in catalog available from the Union Metal Mfg. Co., Canton 5, Ohio. The catalog describes in detail both double and single post designs, including assembly and installation details, dimensional data and some of the possible variations. Plenty of photographs and drawings are included. Check the reply card for your copy today.

Power Pipe Pushing

571. The answer to underground installation of rigid and flexible pipe or conduit is covered in manual available from Mercury Hydraulics, Inc., 2440 Blake St., Denver 5, Colo. Methods of installation are described and illustrated for flexible pipe, sewer pipe and rigid pipe or conduit. Check the reply card today.

Four-Wheel-Drive Tractor Shovels

572. Literature is available on the Model HU and Model HH Payloader tractor shovels. Features, specifications, capacities and performances are fully covered. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill.

New Type Rubber Joint For Concrete Sewer Pipe

566. Rexon "K" gaskets is a new type rubber joint for coupling 4" to 24" diameter bell and spigot concrete sewer pipe. The 4-page bulletin released by Hamilton Kent Mfg. Co., 427 West Grant St., Kent, Ohio, contains engineering data and diagrams, method of application and photographs. Check the reply card.

Technical Bulletin Describes Flexible Polyethylene Pipe

569. Ace Supplex flexible polyethylene plastic pipe and fittings are described in 8-page Bulletin CE-57 recently issued by the Supplex Co., Div. of American Hard Rubber Co., 93 Worth St., New York 13, N. Y. Contents of the bulletin include: applications for Supplex pipe, sizes of standard pipe and fittings, installation, instructions, technical properties, and estimated flow rates for water in various pipe sizes. Check the reply card.

Handbook of Tying Devices and Accessories For Concrete Construction

573. A complete run-down of the latest in job-tested concrete form-tying and anchoring methods contained in a handbook, has been released by Richmond Screw Anchor Co., Inc., 816 Liberty Ave., Brooklyn 8, N. Y. Strengths, working loads, and dimensions for each device, together with drawings showing their proper use, and a detailed section of tested form-ty engineering procedures, complete with formulas and tables are included. Check the reply card.

Rigid Frame and Bow String Truss Steel Buildings

574. Featured in a 19-page colorful catalog are Stran-Steel's new series of steel buildings varying in widths from 32 to 80 ft. or multiples of those widths. Also described is the Stran-Satin metal wall and accessories for the buildings. Check the reply card or write Stran-Steel Corp., Detroit 29, Mich.

Pressure Filters and Accessories for Water Treatment

575. Type "F" vertical and Type "E" horizontal pressure sand and gravel pressure filters for water treatment are described in detail in a 15-page bulletin. The Permutit multiport valve, automatic controls, rate-of-flow indicators and other accessories are also covered. Specifications are outlined. Bulletin 2225-B is available from the Permutit Co., 330 West 42nd St., New York 36, N. Y., or by checking the reply card.

Compact Chemical Solution Feeder

576. The "Neusol" chemical solution feeder available in three standard sizes, 2.5, 5 and 10 gph, and incorporating either one or two positive displacement pumps is the subject of Bulletin 340-A. Write Infilco Inc., Tucson, Ariz., or check the reply card.

Synthetic and Natural Zeolite Water Softening Units

577. A detailed description of zeolite softening and apparatus employed, utilizing zeolites of various types and capacities, together with sample specifications is given in an 8-page bulletin. Write for Bulletin No. 105, L. A. Water Softener Co., 1007 Air Way, Glendale 1, Calif., or check the reply card.

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Waterstops For Expansion and Construction Joints

19. A polyvinylchloride waterstop "Durajoint", that is resistant to extreme waterhead pressures, tensile strength of not less than 1900 psi, chemically inert and available in easy to handle 50 ft. coils is described fully in literature from W. R. Meadows, Inc., 24 Kimball St., Elgin, Ill., or Tecon Products Inc., 304 S. Alaskan Way, Seattle 4, Washington. Check the reply card for full information.

Reflectorized White or Yellow Crosswalk Markings

578. Crosswalk markings of Perma-Line, the quick setting line that is easily applied, trouble-free, economical, and which outlasts paint 4 to 6 times, is described in literature of the Veon Chemical Corporation, 22-09 Bridge Plaza North, Long Island City 1, N.Y. Available in reflectorized white or yellow. Tests under your local conditions are invited. Get details by checking the reply card.

Literature on 1957 Chevrolet Utility and Maintenance Trucks

579. Light and medium duty 1957 Chevrolet trucks are described fully in literature available from Chevrolet Div. of General Motors, Detroit 2, Mich. New features include modern versions of Thriftmaster and Jobmaster 6's and the short-stroke Trademaster V8's and the 283 cu. in. Taskmaster V8's. Also optional features are the Hydra-Matic and Powermatic transmissions. Check the reply card.

Steel Cabs Designed to Fit Most Any Tractor

582. Cabs that assure operator comfort winter or summer, will fit most popular makes of front end loaders, back-hoes or combinations. The cab consists of heavy gauge steel top and supports with heavy duty canvas side and rear curtains, safety glass windshield and side windows of vinyl plastic. For details and prices check the reply card or write Northeast Equipment, Inc., 9 Brookfield St., Worcester, Mass.

Waste Receptacles For Cleaner Streets

581. A complete catalog on the Bennett waste receptacle is available from The Bennett Manufacturing Co., Alden, N.Y. Eye catching stenciled messages on 1, 2, 3, or 4 sides invite people to keep the streets clean. The receptacles are made of heavy gauge steel, molded joints, stainless steel feet and baked on enamel finish. Check the reply card today.

Snow Removal Attachments For Tractors and Graders

580. Hydraulic lift "V", right-hand wing and reversible trip-blade snowplows, snow buckets, hydraulic sweepers and light materials buckets for tractors and graders for snow removal are described fully in literature from Allis-Chalmers, Construction Machinery Div., Milwaukee 1, Wisc. Check the reply card.

Detailed Data and Prices on Optical Repeating Transits

583. Optical repeating transits are described fully in literature available from Wild Heerbrugg Instruments, Inc., Main at Covert St., Port Washington, N.Y. Check the reply card for information on design, operation and prices.

Complete Package Dravo Incinerator Plant

584. The Dravo incinerator includes receiving pits, automatic refuse handling system, automatic combustion controls, traveling grate stoker and everything necessary for the efficient operation of the plant with minimum personnel. Write for full information to Dravo Corp., Dravo Building, Pittsburgh 22, Pa., or check the reply card.

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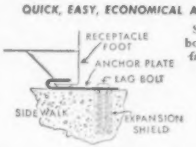

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71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 100-page booklet is available by checking reply card W. T. Taylor Co., 7304 York Road, Baltimore 4, Md.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.

Propeller Type Meters For Measuring Liquid Flow

107. A twelve-page color bulletin on complete line of Propelofio Meters, a direct-reading, propeller type instrument for metering water and other liquids is now available. General information on description, specifications, types, installation dimensions and operation of meters are included. For your copy of Bulletin 380-K4A write Builders-Providence, Inc., 345 Harris Ave., Providence, R. I., or check the reply card.

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Hydraulic lift "V" snowplow—

designed for fast, easy movement of snow. Plow is curved to lift and carry snow up and out . . . with less grader effort. Clears 9-ft path each pass.

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has full range of positions with independent hydraulic control from the cab. Rugged, rigid construction with heavy box-frame reinforcing on back of moldboard.

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HYDRAULIC "V" SNOWPLOW—

has advantages of larger plows. Big 8-ft "V" width blade rolls, lifts and carries snow away. Three-point suspension permits following road crown.

REVERSIBLE TRIP-BLADE SNOWPLOW

removes snow right down to the pavement. Minimum cutting width of 7 ft, 7½ in. means a wide path, fewer passes.

SNOW BUCKET—

stockpiles snow or loads it into trucks a yard at a time. Hydraulically controlled from grader cab. One cu-yd bucket.

. . . TRACTOR SHOVELS . . .

LIGHT MATERIALS BUCKET FOR SNOW—

replaces regular bucket for big snow-handling capacity. Ideal for work in town or country.

SNOW BUCKET FOR	CAPACITY, CU YD	TRACTOR SHOVEL WEIGHT
HD-6G	2¼	19,790
HD-11G	3¾	32,170
HD-16G	5½	48,325
HD-21G	7	66,735

MODEL IB WHEEL TRACTOR

HYDRAULIC SWEEPER—

cleans light snow off parking areas, sidewalks, skating rinks, etc. Sweeps 4½-ft path.

HYDRAULIC "V" SNOWPLOW—

easily mounted to make the IB an all-purpose unit. Lifts and rolls snow with little effort . . . plows 4½-ft path.

HYDRAULIC REVERSIBLE TRIPPING-BLADE SNOWPLOW—

built to take the heavy shock of plowing work. Blade rides over obstructions. Minimum cutting width of 4 ft.

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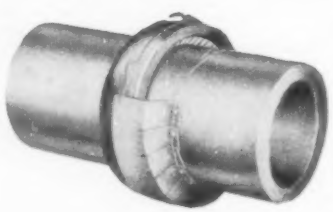

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(a cement joint)

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Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes. Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A. Chicago 80, Ill. Check the reply card.

Meters and Instruments For Water Works

43. An attractively arranged 20-page booklet issued by Sparling Meter Co., 225 No. Temple City Blvd., El Monte, Calif. furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the reply card for your copy, or write for Bulletin 314.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves.

What You Should Know About Pipe Locators

94. A new, up-to-date operating manual for pipe detecting instruments has been made available by the Computer-Measurement Corp., 5528 Vineland Ave., No. Hollywood, Calif. Although written chiefly for the Detectron Model 505, it contains operating hints and other information useful with any make pipe detector. To get a copy just check the reply card.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the reply card for full information including table of filter sizes and capacities, space required and filter operation.

Specifications for Infiltration Galleries

159. Infiltration galleries, constructed by the Ranney method, are described in an attractive bulletin issued by Ranney Method Water Supplies, Inc., 841 Alton Ave., Columbus 19, Ohio. This bulletin, plus complete standard specifications for the construction of horizontal infiltration galleries, are available by checking the reply card.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the reply card.

Manual Covers All Types Of Pipe and Service Repairs

266. Full details on the entire line of Skinner-Seal pipe repair clamps, service fittings and drilling equipment are presented in a new catalog and service manual offered by the M. B. Skinner Co., South Bend, Ind. Step-by-step installation pictures and captions give clear, concise instructions for the repair of all types of pipe leaks. Get helpful Catalog GW by checking the reply card.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the reply card.

Pressure Pipe Installation Guide

237. A new 108-page instruction manual just issued by Johns-Manville, 22 East 40th St., New York 16, N. Y., is planned for on-the-job use at the trench site. The instructions take up every step from receiving the pipe at the job to testing the finished installations.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the reply card or write F. B. Leopold Co., Inc., Dept. PW., 2413 W. Carlson St., Pittsburgh 4, Pa.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Expansion-Contraction Joints, Sealing Compounds and Waterstops

272. Helpful data to aid in the selection of premolded highway joint fillers and joint sealing compounds, rubber waterstops for concrete construction in water and sewage plants, sewer joint sealers and many related materials are provided in latest literature of Servicised Products Co., 6051 West 65th St., Chicago 38, Ill. Get full details by using reply card.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 50, Coraopolis, Pa. Check the reply card for your copy.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the reply card.

Case Histories on Water Meter Installations

283. A factual report of the planning and operational procedures used by 11 water departments and companies in the installation of about 200,000 water meters is available from the Ford Meter Box Company, Inc., Wabash, Ind. Monthly meter rates, inspection report cards and various types of pack joint horns and setters are fully described. Check the reply card for your copy.

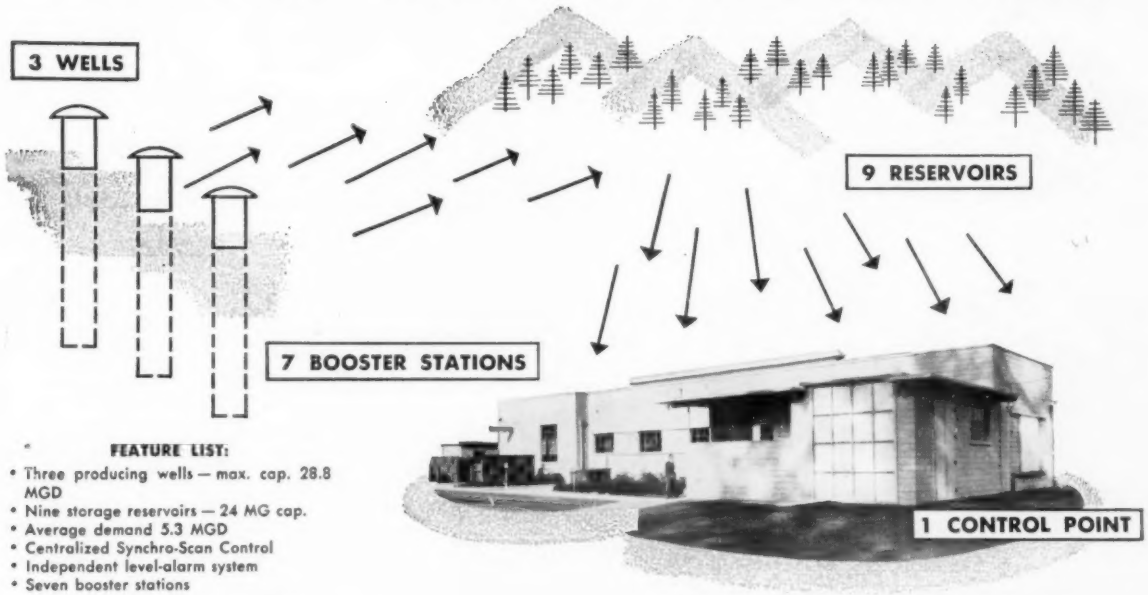
Technical Bulletin on Solenoid Operated Valves

288. Full technical data on application, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7A, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2-in. and 2½ to 36-in. sizes. Get all the details; just check the reply card.

Quick Review of Water Meters

316. A helpful condensed catalog which covers sizes and types of water meters for every kind of service is available from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Each type is illustrated and fully described; specifications and prices are included. Gen. Bulletin W-800 by checking the reply card.

WHITTIER CALLS IT Water ~~AUTO~~MATION



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- Independent level-alarm system
- Seven booster stations

Schematic Sketch — "Water-mation" in Whittier

WE CALL IT *Synchro-Scan* SUPERVISORY CONTROL!

This installation in Whittier, California is a typical example of the supervisory control systems (Water-mation) that Builders-Providence has been furnishing municipalities for years. Installed in conformance with specifications of the consulting engineering firm of Koebig and Koebig in Los Angeles, the Whittier system provides centralized control of the three wells, nine reservoirs, and seven booster stations which furnish the city's water supply. Special provision is made for chart recording and automatic alarm system in the Water Superintendent's office at City Hall.

Builders-Providence Synchro-Scan Supervisory Control, by permitting an unlimited number of control or advisory functions to be performed from a centralized control panel, reduces operating costs of widely-spread systems. All supervised units (pumps, valves, etc.) have individual, interchangeable, "plug-in" components on the master panel which, through transmission over leased telephone circuits (or other means of transmission) offer versatile performance and outstanding dependability over long distances. Bulletin 240-M6 gives full details on this economical, multi-function control system. Address requests to **Builders-Providence, Inc., 356 Harris Avenue, Providence, R. I.,** . . . division of

Master Control Panel — Whittier Pumping Plant

Close-up of "Plug-In" Component

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B·I·F METERS FEEDERS CONTROLS

BUILDERS-PROVIDENCE, INC. • OMEGA MACHINE CO. • PROPORTIONEERS, INC.

To order these helpful booklets check the reply card inside front cover.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000-000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the reply card to get your copy.

Valuable Information On Prestressed Concrete Tanks

356. This helpful booklet describes the design uses and advantages of prestressed concrete in all types of storage tanks. Plenty of charts, diagrams and illustrations are included. Get yours from The Preload Company, 211 East 37th St., New York 16, N. Y., or check reply card.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 225 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the reply card for your copy of this helpful bulletin.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the reply card.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

Information on Pressure Sand and Gravel Filters

406. A 12-page fully illustrated bulletin that completely describes the uses, design features and engineering details of pressure sand and gravel filters is available from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Details of all accessory equipment, the different types of controls available and a detailed table giving capacities, sizes and space requirements are included. Check the reply card.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

For Prompt Service Use The Reply Card

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

Bulletin Fully Explains Golden-Anderson Valves

481. A new bulletin that fully explains the operation of Golden-Anderson valves has just been published by Golden-Anderson Valve Specialty Co., 1244 Ridge Ave., Pittsburgh 33, Pa. In clear concise language and with the aid of simple, easy-to-follow drawings the operation is thoroughly explained. Check the reply card today.

Concrete-Lined Reservoirs

489. A new 24-page booklet published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill., points out the need for linings in reservoirs and the economy of concrete for this purpose. The booklet presents a discussion of design and construction and includes brief descriptions of shotcrete and soil-cement linings. Write to PCA or check the reply card for your copy.

Complete Line of Electric Power and Light Plants

510. Gasoline and diesel engine driven electric power and light plants are fully covered in literature available from Universal Motor Co., Oshkosh, Wisc. Engines, generators, electrical equipment, weights and dimensions are some of the sections included. Check the reply card.

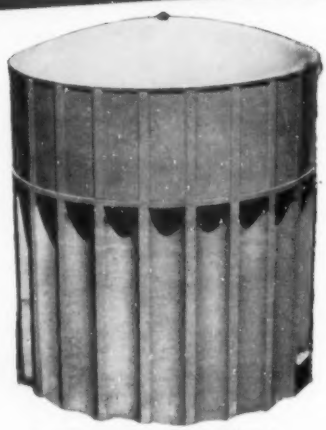
Modern Water Storage in Elevated Steel Tanks

511. A new edition of a catalog on modern water storage in elevated steel tanks has been published by Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh 25, Pa. The 20-page bulletin includes dimensional data and capacities for six basic PDM tank types, in addition to many installation pictures and descriptions. Check the reply card today for your copy of this valuable catalog.

THIS PRELOAD tank

"Rides on Rubber"

To eliminate friction and to reduce restraint at the base of the tank wall which causes vertical bending moments, the wall rests on giant rubber pads. A rubber water stop passes between the footing and wall. These features lick the twin major problems of permitting the wall to move inward or outward due to prestressing and changes in water level and leakage at the base joint. Our Report 1-A gives interesting illustrated details on these features.



2-million gallon prestressed concrete tank on 83' tower at Dallas.

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PRELOAD through its own sales engineers or through the licensees is available for consultation. Technical data and literature available on request.

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FIELD REPORT

on the new TerraTrac® Backhoe-Loader unit

Ben Larsen of Kenosha, Wis., one of the first excavating and sewer contractors in the country to own a new TerraTrac combination backhoe-loader unit, says:

"You just can't beat this new Model '600' TerraTrac outfit for the kind of work we do. It digs *twice as fast* as our former backhoe, and is the easiest rig to operate I've ever seen."

Larsen's son, Bob, who does most of the operating, adds: "The power and ruggedness of this backhoe unit are really outstanding. Even in tough digging, I can get heaped loads fast, without babying the bucket. And when I set the hydraulic stabilizers, *the tractor stays put* — without any rock and roll. I never worry about being dragged into the hole." Bob also likes the time-saving feature of TerraTrac's *exclusive foot-pedal swing controls* because as he puts it, "I can swing the boom 180° with my feet, and still have my hands free to maneuver the bucket and dipper stick."

While Larsen bought his TerraTrac combination backhoe-loader mainly for digging and backfilling utility trenches, septic tanks, etc., he also uses it to dig basements, and do general excavating and grading work.

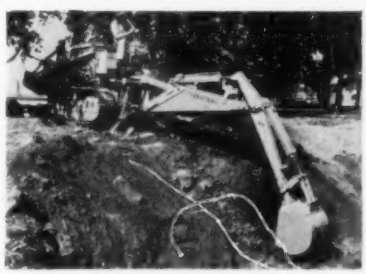
"Torque converter drive and Terramatic transmission make my TerraTrac 600 *as easy to operate as a Cadillac,*" Larsen claims. "All shifting is automatic, and I don't have to worry about stalling the engine or burning out the clutch. With higher forward and reverse speeds, plus both power and pivot steering, I can travel and maneuver twice as fast as any conventional crawler. I can also go places and take tough digging assignments that would be impossible for a limited-use wheel-type rig."

You, too, can handle a wider range of jobs . . . *keep working more days per year,* regardless of weather or ground conditions . . . with the new heavy-duty TerraTrac backhoe, equipped with front-mounted loader or dozer. Low-cost TerraTrac tilt-trailer also available for fast moves. Call your TerraTrac dealer for a convincing demonstration, or send post card today for FREE CATALOG.

TT-B-108

AMERICAN TRACTOR CORPORATION
Box 659, Ft. Wayne, Indiana

On this job, Larsen used the 1 cu. yd. Terra-loader bucket to dig 33′ x 42′ x 4½′ basement . . . then switched to backhoe to cut 40′ x 6′ utility trenches. Entire job was completed in one day. Loader has 9′ dump clearance with exclusive "knock-out" action.



Rugged box-welded boom and dipper stick, combined with big 30 GPM hydraulic pump, and extra-large cylinders, give the TerraTrac backhoe tremendous power for fast digging in any material. Machine reaches 18′, digs 12½′ deep, lifts full bucket loads 10′5″ high without spillage.

Fast 180° boom-swing, controlled by hydraulic foot pedals, is another reason why the new TerraTrac outperforms all other tractor-hoes. You also gain the advantage of all-weather crawler traction, plus lower ground-pressure—only 7.0 to 7.5 lbs. per sq. in.

To order these helpful booklets check the reply card inside front cover.

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet to made on business letterhead.

Design Data on Chemical Flocculating Equipment

89. Flash mixers, Straightline mixers, conveyors and elevators for handling chemicals are described in illustrated Bulletin No. 2442 available from Link-Belt Co., Colmar, Pa. Selection tables and diagrams are provided to help you select the equipment best suited to your needs. Check the reply card for your copy.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif. Get latest data by checking the reply card.

Submersible Sewage Ejector Simplifies Installation

275. The Weil submersible non-clog sewage ejector is a compact unit with a completely sealed motor, available in several sizes with capacities up to 300 gpm. For details on unit selection, installation methods, construction features and controls get Bulletin SE-860A from Weil Pump Co., 1530 No. Fremont St., Chicago 22, Ill. Check the reply card.

A Pressure Proven Joint for Concrete Pipe

335. Investigate the Amseal Joint on low pressure concrete pipe for intercepting sewers, inverted syphons, sewage force mains and low pressure water supply lines. This folder is published by American-Marietta Company, Concrete Products Division, 101 East Ontario St., Chicago 11, Illinois. Describes concrete pipe for use in sewer and water lines where maximum operating pressure will not exceed 50 psi. Check the reply card today.

A Tractor-Air Compressor Unit

140. "Around the Clock, Around the World" is the title of an 8-page bulletin describing Le Roi's new 125 Tractair, a self-propelled compressor unit with flexible tractor power. Applications, uses, attachments and tools, design and specifications of the compressor and engine are listed. Write Le Roi Division of Westinghouse Air Brake Company 1706 South 68, Milwaukee 14, Wisconsin, or check the reply card for your copy.

Helpful Data on Bermico Pipe Fittings

280. Data are now available on fittings for use with Bermico sewer pipe and perforated pipe—T's, Y's and bonds—in sizes and combinations not previously available. These make complete root-proof, water tight, corrosion-resistant Bermico pipe systems. Get full information by checking the reply card. Brown Co., 150 Causeway St., Boston, Mass.

Helpful Bulletins Give Sludge Pump Details

318. "Scru-Peller" sludge pumps for handling thick primary sludge, cutting up all solids as they pass through the pump, described with illustrations of details in a 20-page Bulletin 190B. Standard non-clog pumps are described in Bulletins 126E and 127D. Get them from Chicago Pump Co., Dept. J, 622 Diversey Pkwy., Chicago 14, Ill., by checking the reply card.

Single Pneumatic Ejector Sewage Lift Station

322. The "Mon-O-Ject" factory-built single pneumatic ejector sewage lift station for small subdivisions, factories and schools is described fully in Bulletin 1615 just released by Smith & Loveless, Inc., P.O. Box 8172, Kansas City, Mo. How it works, typical specifications for engineers and architects and the advantages of the station are a few of the discussions. Check the handy reply card for your copy.

Modern Methods and Materials For Jointing Sewer Pipe

402. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading. Get a copy by checking the reply card.

Combat Unpleasant Odors At Municipal Sanitation Sites

404. Malodors at municipal refuse disposal sites, waste treatment plants and incinerators may be effectively "neutralized" by the odor masking products of Rhodia, Inc. Be sure to investigate this means of eliminating complaints from unpleasant odors. Write Rhodia, Inc., 60 East 56th St., New York 17, N. Y. or check the reply card.

Getting Improved Sludge Dewatering With Non-Clogging Vacuum Filters

425. Latest information on the Komline-Sanderson "Coilfilter," which features non-clogging, permanent filter media to obtain constant output and low operating cost is presented in illustrated Bulletin No. 102 by the Komline-Sanderson Engineering Corp., Peapack, N. J. Be sure to investigate this improved method of sludge dewatering. Check the reply card today.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details get Bulletin SP-10 by writing to Western Machinery Co., 650 Fifth St., San Francisco 7, Calif., or check the reply card.

Portable, Standby Or Continuous Power

440. Generators and power plants for emergency, portable continuous power are described fully in literature available from Katolight Corporation, Box 891-107, Mankato, Minnesota. Information on motor generator sets, high frequency changers and independent generators up to 400 K. W. is included. Check the reply card. today.

Now sewer capacity

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The development of Armco SMOOTH-FLO Sewer Pipe makes it possible for the first time to design and construct a sewer having top flow capacity—with full assurance that it will remain that way through long service.

Flow capacity of each length of SMOOTH-FLO Pipe is high to start with. A full bituminous lining completely fills the corrugations. And when the pipe is installed, bolted coupling bands formed to fit the pipe corrugations make joints strong and tight. Sections can't pull apart or be forced out of alignment. Flow capacity stays high from one end of the installation to the other. And the lining material itself is extremely dense and durable—with proved ability to stand up under severe service conditions.

Write us for complete data about Armco SMOOTH-FLO Sewer Pipe and other economical Armco Sewer Structures, including ASBESTOS-BONDED and PAVED-INVERT Pipe. There is a size and type for practically every sewer job. Armco Drainage & Metal Products, Inc., 3316 Curtis St., Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

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sliding or screw type cast iron valve boxes for covering 4" thru 10" valves for water or gas. Rugged construction for lifetime service. 5¼" shaft. Extensions as required.

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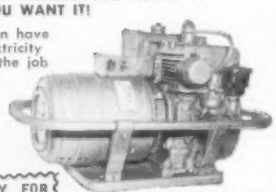

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Submersible Pumps For Municipal Use

185. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

Complete Information on Portable Electric Plants

202. New power-packed electric plants that are smaller and easier to move around are fully described in literature available from D. W. Onan & Sons Inc., 3682 University Ave., S. E. Minneapolis 14, Minn. Applications, specifications and optional equipment are covered. Check the reply card.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the reply card.

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STREETS AND HIGHWAYS

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered. Check the reply card.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio. Use the reply card to get your copy.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co, Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the reply card for your copies.

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the reply card today.

The Modern Approach to the Brush Problem

222. Eliminate your brush disposal problem by using an Asplundh Chipper. For complete information on what the Chipper can do, how it can save on costs, various types available and other outstanding features write to Asplundh Chipper Co., 505 York Road, Jenkintown, Pa., or check the reply card.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the reply card or write to Butler Mfg. Co., Kansas City, Mo.

Paving Manual on Asphalt Hot-Mix Design

Authoritative instructions on mix design methods for hot-mix asphalt paving are furnished in a new 168-page pocket-size manual published by The Asphalt Institute. The Marshall, Hveem, Hubbard-Field and Smith Triaxial methods are outlined in detail; test procedure and interpretation of data are provided for each method; and information is given on gradation analysis of aggregates and on density and voids analysis of compacted paving mixtures. The price of this Manual is $1.00. To order, write direct to The Asphalt Institute, College Park, Md.

How To Build Stabilized Heavy Traffic Pavements

233. A 16-page booklet published by Seaman-Andwall Corp., Milwaukee, Wis., shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worth-while booklet for every highway engineer. Check reply card for copy.

What You Should Know About Soil Sampling

255. Acker Soil Sampling Catalog No. 25 contains a complete and thorough collection of information about soil sampling in all types of sub-surface conditions. Modern sampling techniques are discussed together with recommendations as to tools and accessories. Write Acker Drill Co., Inc., Scranton, Pa., or check the reply card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the reply card for your copy.

Overlaid Fir Plywood For Street and Highway Signs

304. Literature is now available on Harborite, an overlaid fir plywood, for street and highway signs. One booklet covers the results of tests conducted on the use of overlaid plywood for signs and another bulletin includes a sample of Harborite and additional information on its use in municipal, county and state traffic departments. Check the reply card or write Harbor Plywood Corp., Aberdeen, Washington.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal; and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tourneau-Westinghouse Co., Peoria, Ill., or use reply card.

Tractors and Equipment for Municipal Use

407. Specifications for the John Deere "40" crawler and "40" utility wheel tractors, together with equipment for loading, dozing, mowing, sweeping and many other operations is covered in a comprehensive illustrated catalog issued by John Deere, Dept. 66B, Moline, Ill. Get your copy by checking the reply card.

Sign Catalog Has Latest Specifications

417. Detailed information on all classifications of standard signs for traffic control, street identification and other purposes together with a complete line of accessories is presented in a convenient Sign Manual by Lyle Signs, Inc., 2731 University Ave. S. E., Minneapolis 14, Minn. Get Catalog B-55 for most recent data and specifications on U. S. Standard signs.

Literature Available on Wagner Tractor Equipment

464. Information on the Wagner back hoe and loader is available from Wagner Iron Works, Dept. 129, 1905 South First St., Milwaukee 1, Wisc. Specifications, types, models and other valuable data are included. For your copy check the reply card.

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"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper"
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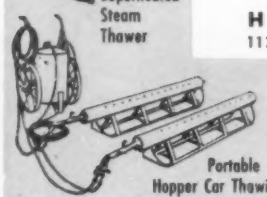

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Valuable Information On Aerial Surveys

437. What you should know about aerial surveys is described in detail in the latest literature just released by Alster and Associates, 6135 Kansas Ave., Northeast, Washington 11, D. C. Topographic maps, mosaics and planimetric maps by aerial photograph are fully illustrated. For more information check the reply card.

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co. Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Complete Bulletin On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 100-page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 148 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill., by checking the reply card.

Literature on a Tailgate Loader

479. Information is now available on a safe, easy to operate tailgate loader. The loader is easy to install, light in weight and will lift a platform load of 600 lbs. It will fit most any standard pick-up or service utility body truck. Check the reply card or write to Midwest Body and Mfg. Div., Electrographic Corp., Paris, Illinois for your literature.

Information on 5 Versatile Tractors For Municipal and County Work

484. Tractors that find scores of highly efficient applications in construction, municipalities, utilities and related fields are described fully in a catalog just released by Massey-Harris-Ferguson, Inc., Industrial Div., Quality Ave., Racine, Wisc. Models, specifications, attachments and uses are covered.

Information on Willys Industrial Engines and Power Units

486. A new bulletin describing fully the 1956 line of "Jeep" four-cylinder industrial engines and power units has been issued by the Industrial Engine Dept, Willys Motors, Inc., Toledo, Ohio. Suggested applications for engines and units, complete tables of engine speeds in relation to torque and horsepower ratings, special features of the engines and a listing of available accessories are included. Check the reply card.

Manual on Basic Blading, A Guide To Motor Grader Operation

532. A 32-page manual with illustrations on the use of the controls, basic blade positions and their applications, and the control positions to accomplish many of the jobs a motor grader does is available from Caterpillar Tractor Co., Peoria, Ill. Check the reply card today.

Snow Loaders That Pay Off All Year 'Round

526. Multipurpose loaders that have high capacity and easy maneuverability as snow loaders and as versatile loaders in the summer season to handle coal or easily convert to leaf and aggregate loaders are fully described in literature available from Barber-Greene, Aurora, Illinois. Check the reply card for capacity, loading rates and specifications.

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REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy reply card.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check the reply card today for catalog No. 1702 from Flynn and Emrich Co., Holliday and Saratoga Sts., Baltimore 2, Md.

Check These Features On Refuse Collection Bodies

383. The Heil "Colectomatic" refuse collection unit incorporates the best features suggested by municipal operating crews, supervisors and private operators to provide easy loading, simple operating mechanism, bulldozer type packing, fast dumping and many other important advantages. Available in 16 and 20 cu. yd. capacities. Check them all by getting attractive Bulletin BH-54103 from The Heil Co., 3044 W. Montana St., Milwaukee 1, Wis. Your copy is ready—just check the reply card.

SNOW AND ICE CONTROL

End Dangerous Ice Hazards

294. Many progressive municipalities use rock salt as standard practice for prevention of ice hazards on streets and highways. Get full data on Sterling "Auger-Action" Rock Salt and suggestions on storage methods from International Salt Co., Scranton, Pa. Check the reply card today.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, Thousand Islands, New York, or check the reply card for the catalogues.

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Wyandotte, Michigan. Other uses of calcium chloride are fully outlined. Check the reply card.

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U-308	87.5 @ 2400	229.5	308.2	$3^{13}/_{16}$x$4^{1}/_{2}$
U-372	104 @ 2200	288	372	$4^{3}/_{8}$x$4^{1}/_{8}$
U-450	126 @ 2200	323	450.9	$4^{3}/_{8}$x5
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CONSTRUCTION EQUIPMENT AND MATERIALS

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

A 1-Bag Capacity Concrete Mixer

72. A catalog describing the Model 6-S Dandie concrete mixer is available from the Kwik-Mix Co., Port Washington, Wisc. Printed in attractive colors, it explains the many construction and operating features of the 1-bag mixer. Also included is information on other sizes. Check the handy reply card.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Handbook on Hot Rolled Carbon Shapes and Plates

412. A handbook every engineer should have on hot rolled carbon shapes and plates has just been released by United States Steel Corp., 525 William Penn Place, Room 5118, Pittsburgh 30, Pa. Check the handy reply card.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the reply card today.

The Crawler Tractor, Backbone of Construction

504. A new 12-page catalog published by American Tractor Corp., Churubusco (Ft. Wayne), Ind., graphically illustrates how and where the 30 to 60 hp TerraTrac tractors fit in the construction picture. Illustrations of the complete tractor line, plus a complete selection of matching loaders, dozers, backhoes, scarifiers and winches are included. Check the reply card.

For Prompt Service Use The Reply Card

Trencher Fits Municipal Needs

315. A builetin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the reply card.

Portable Melting Furnace For Rubberized Joint Sealers

357. The Hauck double jacketed melting furnaces use L-P as a fuel and a high flash point oil for heat transfer to assure close temperature control when melting rubberized joint sealers of all types. All details on this 16-gallon capacity unit are furnished in Bulletin 1081. Check reply card for your copy. Hauck Mfg. Co., 124 10th St., Brooklyn 15, N. Y.

Streamlined Data on Tractors, Scrapers and Power Units

102. The complete line of International Industrial Power products, 73 in all, is described in a new 48-page catalog published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Technical data has been streamlined, yet provides abundant descriptive material on each piece of equipment. Check the reply card for the latest on crawler and wheel tractors, scrapers, dozers and related attachments plus International Diesel, gasoline and gas power units.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the reply card for your copy.

Advanced Tractor Design Gives Better Performance

399. The Ford Tractor offers 4-wheel stability, built-in hydraulic system, power takeoff, as well as greater power, performance and economy. A complete booklet describes five tractor models in two power series, showing the latest in advanced tractor design and including many applications of equipment for saving time and money. For your copy check the reply card or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

Information on An "All-Purpose" Municipal Paint

423. Whether the requirement be traffic paint, sewage plant, exterior finishes for masonry buildings, or interior protection for metal equipment send for literature issued by Cellulose Products Dept., Hercules Powder Co., 978 Market St., Wilmington 99, Delaware, on Parlon. This chlorinated rubber paint shows good resistance against coal gas, chemicals and chemical fumes and salt water atmosphere.

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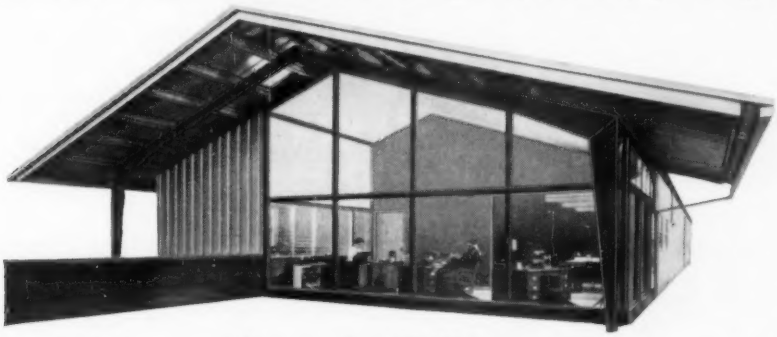

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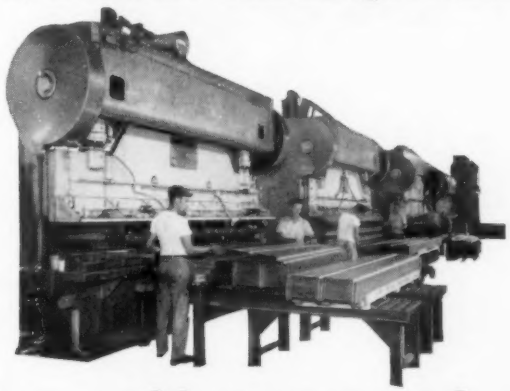

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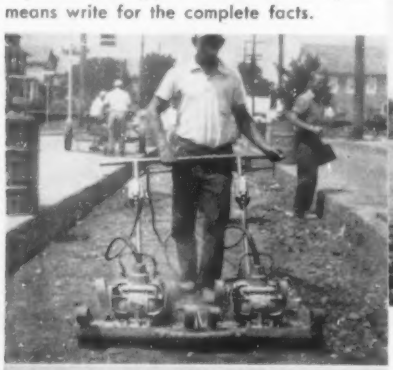

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54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy reply card. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Residential Street Lighting

228. A new 16-page bulletin on residential street lighting is now available from the General Electric Co., Schenectady 5, N. Y. Well illustrated, the bulletin, designated GEA-6316, explains how good lighting benefits a residential community and provides information on how to plan modern residential lighting installations.

Engineering Guide to Mercury Street Lighting

380. Basic engineering aspects of mercury vapor street lighting are discussed in a 35-page Engineering Guide available from Westinghouse Corp., Box 2099, Pittsburgh 30, Pa. This practical reference includes technical data on mercury lamps applicable to general lighting service, operating characteristics of the system and a discussion of methods of economic evaluation of alternative lighting systems. Check the reply card for your copy of this helpful guide.

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CIVIL DEFENSE

Effective Warning Signals Help Safeguard Communities

374. Nation-wide encounters with floods, windstorms and fires have demonstrated the multiple advantages of air raid warnings and signal systems as a means of summoning civil defense and rescue squads to deal with natural disasters. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago 19, Ill. Check the reply card.

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AIR POLLUTION

Reliable Estimates of Smoke Density

85. The Smokescope, product of Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa., offers a reliable method for estimating smoke density. This data is the first requirement of an effective program for air pollution control. Find out how easy it is to take smoke density readings. Check the reply card for Smokescope data.

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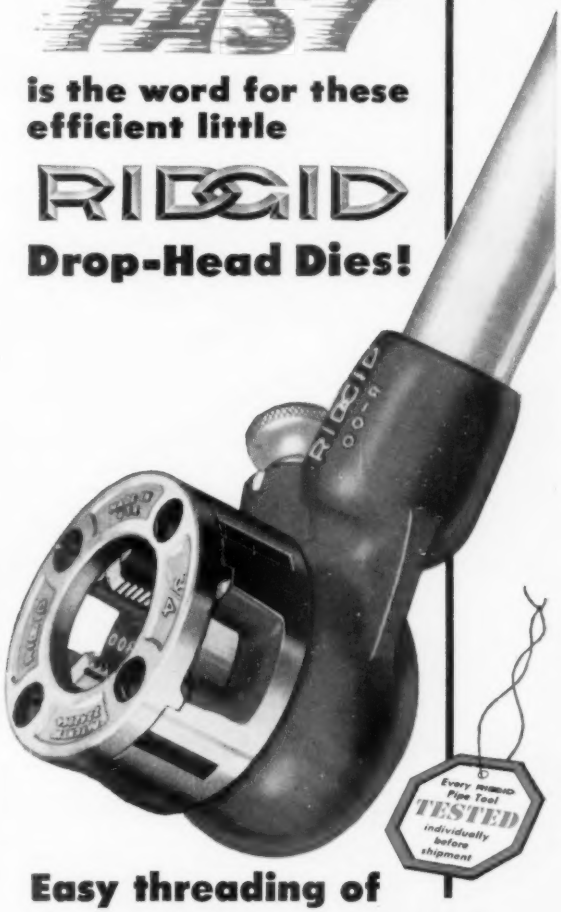

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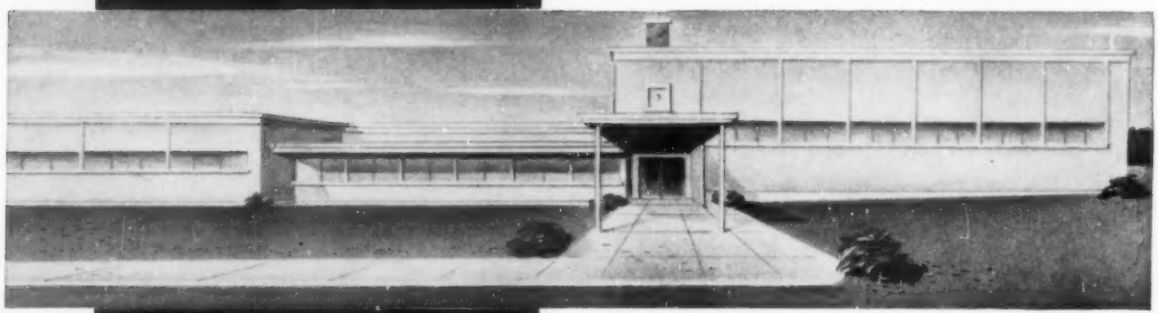
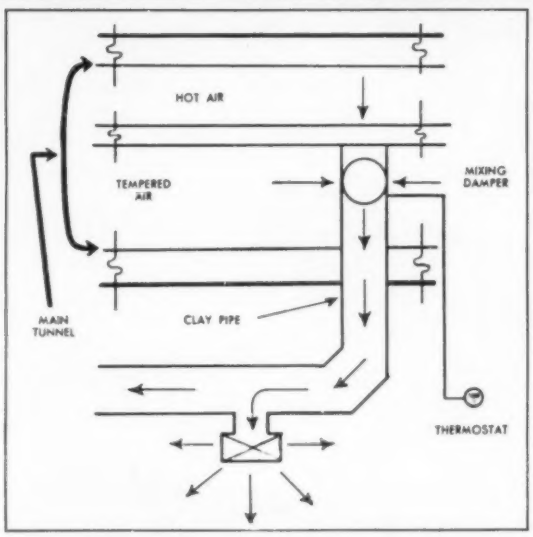
1. Clay Pipe Heating Ducts can be buried under the floor, thus saving valuable space.
2. Clay Pipe Heating Ducts require no maintenance. They are completely unaffected by rust or corrosion and they assure dependable service for the life of the building.

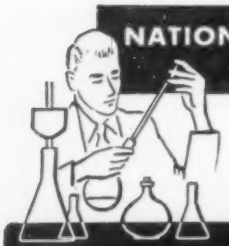


ARCHITECTS: Lagedrost and Walter
BUILDING CONTRACTOR: Cook Construction Co., Orville Waugh, construction superintendent
HEATING CONTRACTOR: Columbus Heating & Ventilating Co.



Consider the advantages of simple installation plus odorless, dust-free heat, and you can see why builders, architects, and heating contractors everywhere are recommending Clay Pipe Heating Duct systems. The influence of Clay Pipe Heating Ducts is also pronounced in homes of all price ranges and commercial structures.

This partial plan view of the heating duct system shows the plenum-tunnel which carries both hot and tempered air the length of the structure. Clay Pipe Heating Ducts feeding off this tunnel are equipped with thermostatically controlled mixing dampers that blend hot air and tempered air. This produces an entirely new conception of uniform warmth from floor to ceiling and wall to wall.



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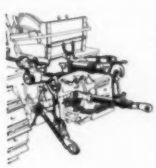
1 *Time-Saving*
DIRECTION REVERSER

Lets you move forward or backward in the same speed—no time wasted shifting gears. Detail shows lever in neutral position, dotted lines reverse and forward travel positions. Available as optional equipment on "420" Crawler and Utility models.

2 *Time-Saving*
FOOT THROTTLE

Increases engine speed and ground-travel speed approximately 25 per cent—makes possible speeds up to 17 mph on the highway. Helpful when maneuvering in close quarters. Inexpensive. Easy to attach. Optional for "420" Crawler and Utility models.

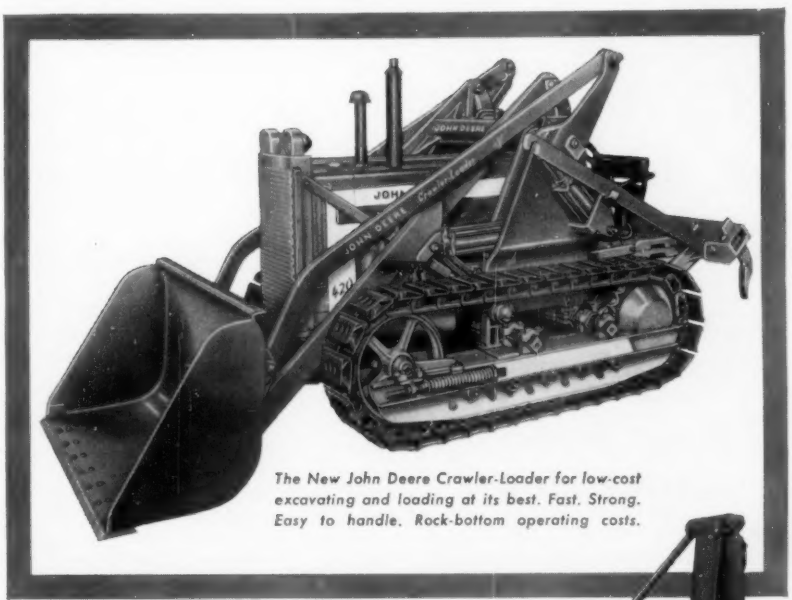
3 *Heavy-Duty*
3-POINT HITCH



Gives you "pick up and go" operation with the John Deere Crawler tractor. Change tools in minutes, raise and lower them hydraulically. Heavy-duty construction. Leveling adjustments made without leaving tractor seat. Optional for John Deere Crawlers.

4 *Time-Saving*
5-SPEED TRANSMISSION

Gives you an extra speed forward for increased versatility in many operations. On Utility tractors, the new speed is 6¼ mph and on the Crawler, 3¾ mph. Quickly repays its small extra cost on mowing, landscaping, etc. Factory installation only.



The New John Deere Crawler-Loader for low-cost excavating and loading at its best. Fast. Strong. Easy to handle. Rock-bottom operating costs.

John Deere "420" Utility Tractor with Loader and Backhoe. Average fuel consumption: about 1 gallon per hour.

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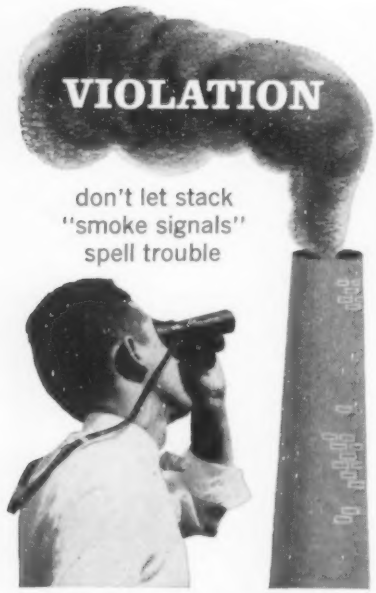

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NEW M•S•A SMOKESCOPE*

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*As described in the U. S. Bureau of Mines Report of Investigation, R.I. 5162

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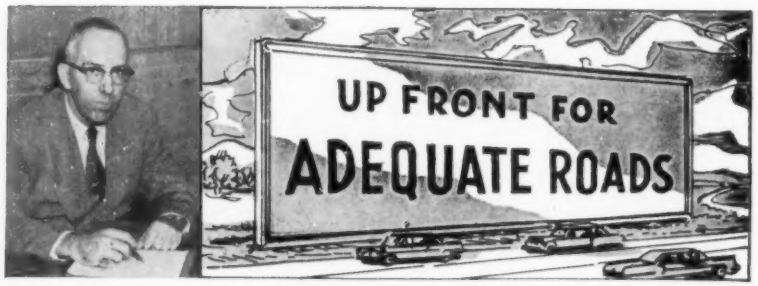


by **LEO J. RITTER, JR.**

Highway Consultant

Increasing Engineering Productivity —Our old friend, H. A. Radzikowski of the Bureau of Public Roads, gave an interesting paper at the National Highway Conference of County Engineers and Officials held in September under ARBA sponsorship. The paper dealt with that currently popular topic of increasing engineering productivity. Radz expounded many of the things which we have noted in these columns in the past. Information which we gleaned from the paper includes the following:

(1) There are now 246 county and local highway departments using radio telephone in the management of mechanized maintenance and construction operations.

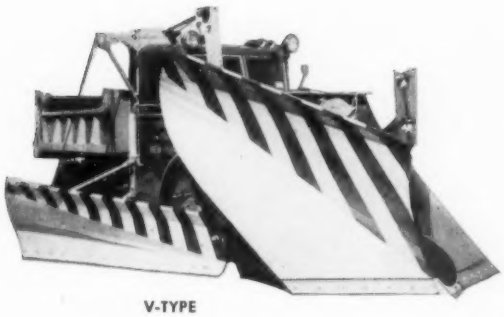
(2) The Bureau of Public Roads has printed a 96-page "Reference, Guide, and Outline of Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways." Copies can be obtained from The Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Unfortunately, the price was not stated.

(3) The electrical resistivity method of subsurface exploration is growing in popularity, particularly for locating sand and aggregate deposits. The BPR recently built several earth-resistivity machines for its own use at a cost of less than $800 each. Copies of the specifications can be made available to any local organization upon request.

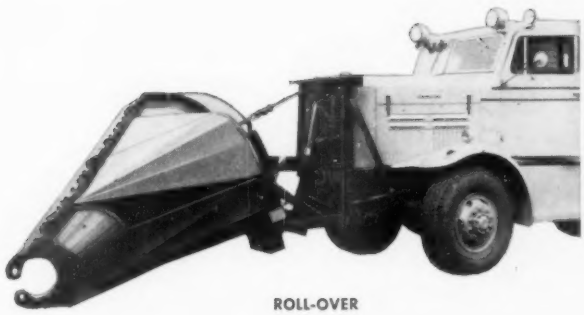
(4) There are a number of electronic computer service centers scattered across the country—at various universities and in 114 of the larger cities in 39 states and the District of Columbia, from which city and county highway departments can rent computer services. The rental of computer time is a reimbursable expense (engineering) on the federal-aid system (50-50 basis).

(5) A program (electronically speaking) is a series of orders to a computer as to how to act in the analysis of a specific engineering problem. The development of a program is expensive and time-consuming. Once developed, however, the use of the program is routine, fast, and economical. The program can be used by any highway department. The Bureau of Public Roads is interested in the development of a library of electronic computer programs which can be made available to all highway departments. Such programs will be convertible to any make of machine. The BPR is now working on a series of procedural guides covering earthwork computations made by renting computer time. This guide will describe the nature of the field data that should be secured, the form in which it should be presented, and the form in which the processed data will be returned ready for plan preparation, engineer estimates, and construction staking. Copies of the earthwork computation procedural guide, when ready, will be made available to all county and local highway departments.

Beginning of the End? — From where we sit—in the position of a sideline quarterback, more or less—it looks to us as though another great historical era in American highway history is beginning to draw to a close. We refer, of course, to the second era of toll road construction in this country's boisterous history—the first was from 1796 to about 1810. Since the second World War, as everyone knows, we have been in another era of turnpike construction, an era which is not yet over. However, the level of activity is beginning to taper off—after 1957, what toll roads will still be under construction? The only ones we can see at present writing are the Illinois system and the Sunshine State Parkway in Florida. The reason for the change in outlook is obvious—with the federal government now committed to completion of the National System of Interstate Highways and putting up 90 percent of the construction money, why



V-TYPE



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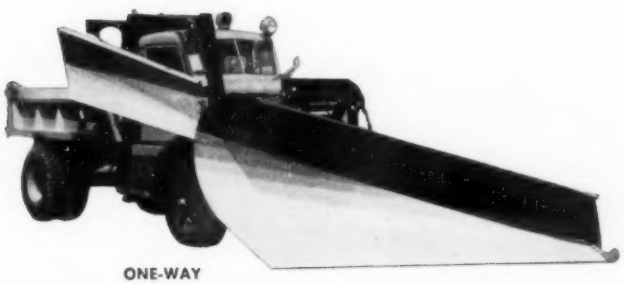
Every important Snow Plow improvement has originated at FRINK'S



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POWER REVERSIBLE

FRINK V-TYPE SNO-PLOWS have long been the standard in heavy duty plowing. This model has been continually improved and refined as a result of Frink's continuous engineering research to make better plows. As a result, Frink V-Type Sno-Plows are SELF-BALLASTING; they PUSH EASIER, BEVEL SIDE BANKS; and there is NO SIDE THRUST.

THE ONLY ROLL-OVER, Taper Blade developed by any manufacturer. Hydraulically rotates from left hand to right hand plowing position in 15 seconds. This rugged plow has been very successfully used – particularly on dual super highways and airports. *Eliminates deadheading. Easier to Park.*

THE "400 SERIES" ONE-WAY Trip Blade Sno-Plows combine all the desirable features that place them ahead of the field in performance and efficiency. They are the finest speed plows manufactured. The mold-board has the taper and curvature which makes the throwing and spreading qualities better than any other one-way snow plow, yet at slow speeds these Frinks neatly windrow the snow.

THE FRINK POWER REVERSIBLE is the most recent completely redesigned Sno-Plow of the Frink line. It is the all purpose plow – plows to the left, to the right, or bulldozes straight ahead – all positions automatically set by means of one convenient cab lever even while plowing. The reversible plows city streets, expressways – cleans up intersections, parking lots, airport ramps and public areas. It is THE all purpose plow.

FRINK SNO-PLOWS

Clayton, 1000 Islands, N. Y., Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

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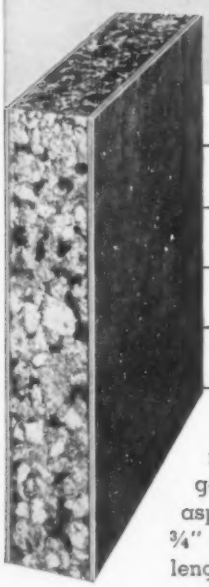

1. Non-extruding
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3. Low moisture absorption
4. Readily handled without breakage
5. Least expensive non-extruding type

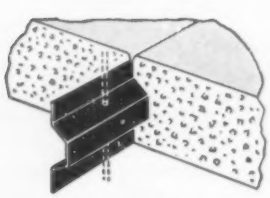
KORK-PAK—an exclusive Servicised development—is composed of cork granules bonded together with asphalt between two sheets of heavy asphalt saturated paper. Available in ¼", ⅜", ½", ¾" and 1" thicknesses, widths to 36", and standard lengths of 5 or 10 feet. Longer lengths supplied on special order.

SERVICISED ASPHALT JOINT FILLER

★ Forms an easily compressible cushion
★ Highly waterproof
★ Low in cost

A composition of asphalt, vegetable fibre and a small percentage of finely divided mineral filler formed between two sheets of asphalt saturated paper which increases strength and rigidity and improves handling. Available in ¼", ⅜", ½", ¾" and 1" thicknesses, widths to 36" and standard lengths of 5 or 10 ft.

TONGUE AND GROOVE JOINT



★ Provides quick, low-cost tongue and groove joint for keyed slab construction
★ Rigid . . . easy to handle and install

Servicised Tongue and Groove Joint consists of a high grade asphalt mastic core formed between sheets of heavy asphalt saturated paper. It is waterproof, non-extruding and extremely durable. Supplied with punching for dowel bars and stake pins. Available without punching. Standard length 10' 2"; widths from 4½" to 10½" in 1" increments; thickness ¼". Standard widths listed are for slabs from 5" to 11" thick.

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should any state authority borrow money at a high rate of interest to build a toll road? Rural toll roads —as new ventures—will be passé for a while, until the next great cycle of highway transportation demand.

Midwest Round-up —Two events of considerable significance to highway users occurred in September in the middle west. One was the formal opening of 88 miles of the Indiana Turnpike, which crosses the northern part of the state and links the Chicago metropolitan area with the Ohio Turnpike and the eastern Turnpike system. The Turnpike will be completely finished in November. In the northwest corner of Illinois, at Rockford, officials turned the first spadefuls of earth for the long-delayed Illinois Toll Road System—over $400 million is available for construction of Illinois Toll Roads, with completion of certain elements of the system scheduled for early 1958. Early in September, also, the new Broadway Bridge (across the Missouri) was opened in Kansas City—we had the pleasure of riding across this fine structure a few hours after the ribbon-cutting ceremonies. Work is being rushed to completion on the Kansas Turnpike, which runs 236 miles from Kansas City to Topeka to Wichita and south to the Oklahoma border; the full length should be open by the time you read this.

Fabric-in-Asphalt — One of the most logical applications of welded wire fabric in reinforcing asphaltic concrete pavements is at heavily used bus stops. Use of the fabric tends to prevent the rutting and shoving which frequently take place in pavements of this type at locations where heavy buses stop and start again and again. A successful application of this type of construction is on the north passenger bus stop on the New York side of the George Washington Bridge, where 500 New Jersey-bound buses stop every day. Resurfacing of the bus stop with fabric-in-asphalt was carried out this summer, after two years of observation of a trial section.

Quotable Quotes — One of our favorite writers in the highway field is W. L. Haas, Director of Administration of the Wisconsin State Highway Commission. His articles fairly bristle with "Quotable quotes", as evidence these from a recent article in *Highway High-*

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Says Leading Eastern Contractor

Heltzel Adjacent Curb Forms being set in place with a crew of two.

Heltzel Forms strip clean and easy cutting crew time to a minimum.

John Keelor, head of Keelor Construction Co., going over job blueprints with G. L. Finnen, Resident Engineer, and E. R. Hummell, District Construction Engineer.

"I've used all the popular makes of steel forms in my years in the construction business and I find the **Extra Quality** built into Heltzel Forms means **Extra Profits** right down the line," says John Keelor, head of the Keelor Construction Company, Pennsburg, Pa., one of the east's leading construction firms.

"Heltzel Forms are designed right, to go down fast and strip easy with a minimum crew. The stake pockets are situated where they should be to give maximum support without bowing. And, Heltzel Forms can take the punishment of everyday use without failing."

When next you're in the market for steel forms for any purpose, remember it costs no more to have the finest. Specify Heltzel Steel Forms and get the **Extra Quality that means Extra Profits.**

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Simplicity in Design — Change or service blades in 20 minutes. Ready accessibility permits service quickly *right on the job*. Minimum of moving parts means less maintenance, lower repair costs.

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BY ACTUAL TEST THE FASTEST CHIPPER MADE

lights dealing with the importance of local rural roads.

"This concept properly should recognize the county as an effective and active participant in the development of our highway systems. It further implies a cooperative partnership arrangement in which emphasis is placed upon local initiative and responsibility, rather than upon a continual expansion of the states' responsibilities for local road administration."

"The highway department must (also) establish an active secondary roads section, not only to administer the Federal-Aid secondary act, but also to provide consultation, assistance, and technical services to the counties."

"A strong state-wide county association under competent management and direction is necessary to provide effective representation of county interests."

"Perhaps the most useful tool for the county administrator is the sufficiency rating system, which provides a running inventory of the condition of county roads and thereby a priority rating for orderly construction. It is now being used by a majority of Wisconsin counties."

Mighty fine ideas and very well said, too.

From Here and There— John B. Benson, Jr., County engineer of Covington and Macon Counties (Alabama) has been elected president of the newly formed National Association of County Engineers. We'll try to get more dope on this new organization for you in the next issue. The Engineering Experiment Station of Oregon State College (Corvallis) has issued a new bulletin, "Evaluation of Typical Oregon Base-Course Materials by Triaxial Testing," by M. A. Ring. The Brookings Institution and Wilfred Owen have issued another of their comprehensive reports—this one is "The Metropolitan Transportation Problem"—available at $4.50 from the Brookings Institution, 722 Jackson Place, N. W., Washington 6, D. C. Indiana is in trouble, unless new sources are found for state highway department funds to match those of the federal government—the Indiana Highway Study Commission has estimated that $39 million of additional revenue will be necessary during the next two years for the state to keep pace with the accelerated highway program. The State Road Department of Florida has embarked on a program of standardizing rural highway markers by color.

GREAT NEW IDEA in tractors and attachments

PAY-OFF FOR CONTRACTORS — Work Bull Model 404 handles cleanup jobs at a minimum cost per hour . . . scoots from job to job with no road or highway restrictions.

PAY-OFF FOR UTILITIES — Here, a Model 303 with backhoe excavates quickly, economically . . . wheels down city streets, without flat beds or towing equipment.

PAY-OFF FOR MUNICIPALITIES — Model 202 (above) not only cuts grass, but also assists street crews . . . can be equipped to handle stockpiling, trenching and back-filling.

M-H-F WORK BULLS

Now from one source . . . a package of 5 versatile, low-cost tractors with 20 power-matching attachments

Measure your profit problem against the bright, new versatility of M-H-F Work Bulls. Never before so much pay-off workability at such low cost!

Tough manhandling projects become a breeze with a Work Bull—34 to 52 hp—digging, dozing, lifting, loading, hauling, mowing, handling scores of jobs on all projects.

And when the job is too small for a large machine, it's just right for a Work Bull. Attachments quick-change in 5 to 15 minutes with no special gear.

Maintenance costs little, too — Work Bulls are built to "construction standards" . . . always ready for rugged duty. And when you think of maintenance, remember this. You'll be dealing with a single retail distributor for sales and service on both tractors and attachments. One source, one responsibility — a definite advantage for you.

Write today for your retail distributor's name and free, 24-page illustrated catalog.

PAY-OFF FOR INDUSTRIES — Work Bull fork-lifts work on or off hard surface. Model shown lifts up to 4000 lbs., with 10 ft. mast, has mast extension for 21-ft. reach for lighter loads.

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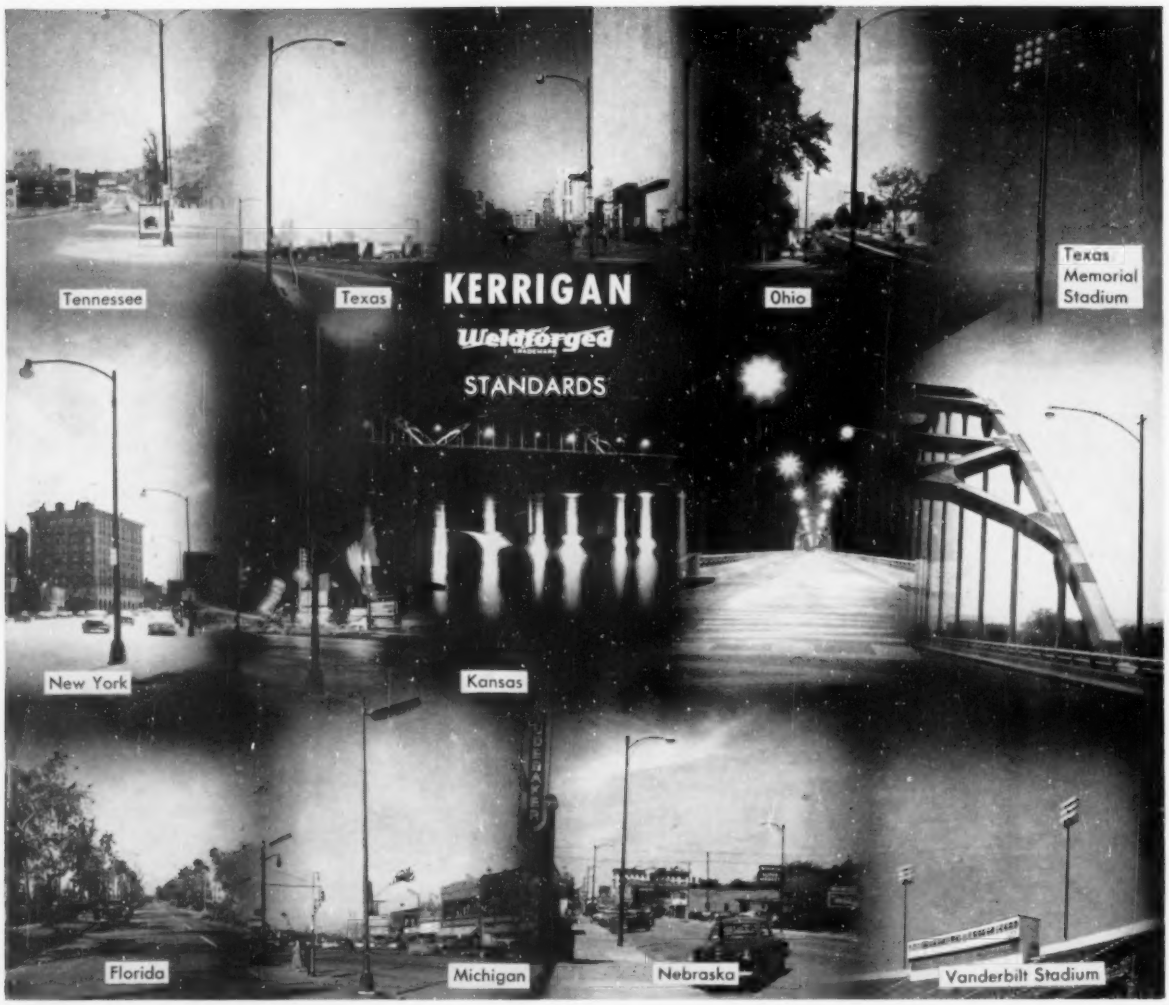

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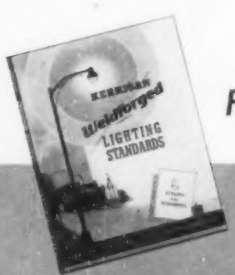
Wherever you go you'll see Kerrigan Weldforged lighting standards—on streets, highways, thruways, bridges, in parks, shopping centers, stadiums, etc. Made from J&L'S low-alloy, high tensile, corrosion resistant steel, they last longer and offer greater resistance to corrosion and stress. Kerrigan standards lend beauty, too, to any installation with their continuous tapered, octagon design.

It will pay you to investigate Kerrigan Weldforged standards . . . also traffic signal standards . . . in steel and aluminum. Send for illustrated catalog complete with engineering data.



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Engineers thinking in long-range terms of thoroughly proved sewer main performance . . . contractors interested in serving community needs at new lows in installed cost—both should know all about Transite® Pipe and the Ring-Tite® Coupling. Here is a new booklet that tells and shows how Transite Pipe reduces infiltration, keeps out roots; maintains high flow capacity; speeds installation; permits designing the system for savings. Send the coupon for it today.

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WITH THE RING-TITE COUPLING

Johns-Manville, Box 60, New York 16, N. Y.
Gentlemen—Please send me your new Transite Sewer Pipe Brochure, TR-165-A.

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Continued confidence is the finest proof of product performance. In 1954 the Westgate sewage treatment plant in Fairfax County, Virginia, designed by Massey Engineers, placed their two 200 sq. ft. Coilfilters in operation. When equipment was purchased for three more Fairfax County plants in 1956, it was only natural that Coilfilters should be included.

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Alexander Potter Associates are Consultants to the County of Fairfax.

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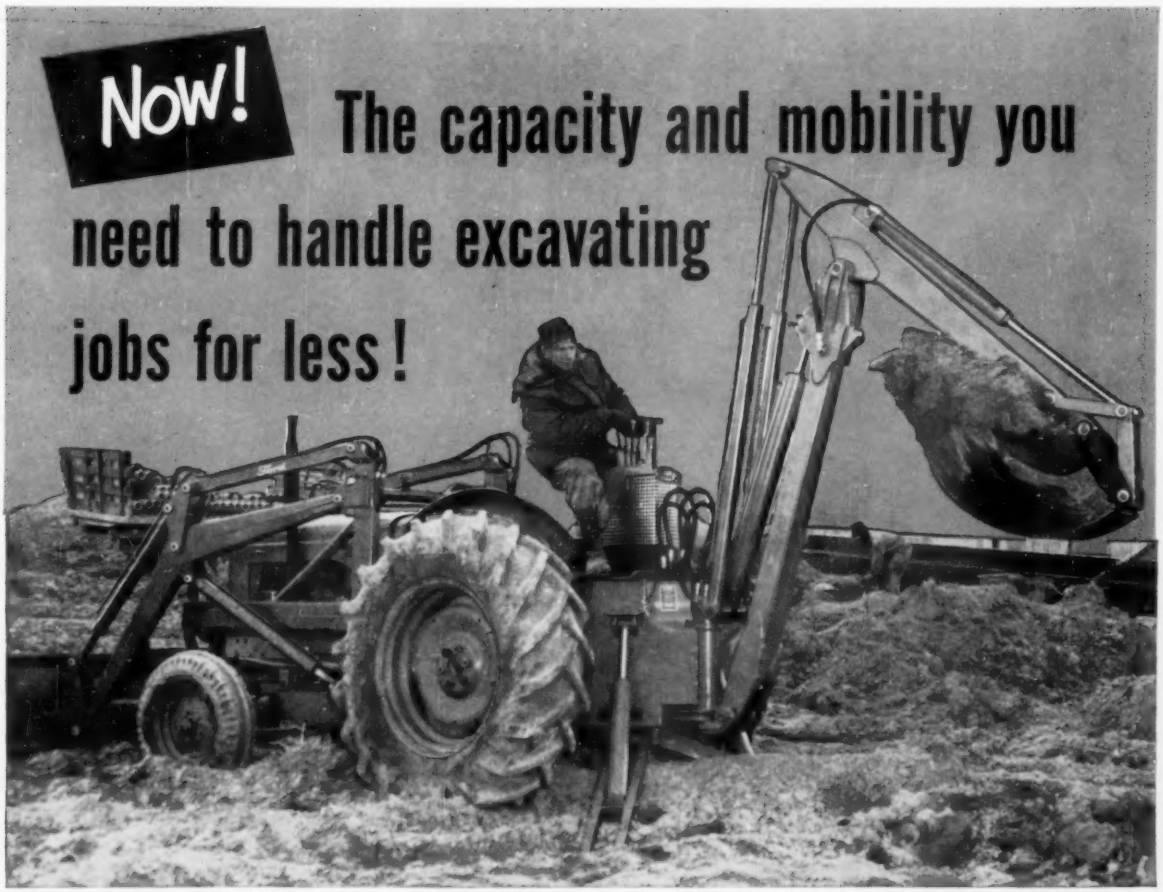

F. M. D. Tractor-Loader **gives you 5/8 yard bucket capacity. A touch of a lever and double-acting cylinders on lift arms and bucket deliver positive down pressure . . . over two tons of breakaway power . . . 2000 lbs. load capacity at full lift. Easily attached blade makes it an excellent unit for backfilling, grading and dozing.**

Low-Cost FORDSON MAJOR DIESEL

The right combination of capacity and mobility makes the Fordson Major Diesel today's best power buy for many types of ditching, trenching and excavating jobs. Here's what we mean:

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Engineers in charge of new Municipal Water Works filtration systems are more and more favoring the SPARKLER DIATOMITE FILTER MODEL SCJ because:—

1. The original cost of a diatomite plant for public supply is ½ to ⅓ the cost of a sand plant of equal capacity.
2. Diatomite filtration reduces the chlorine demand of the water by removing organic matter to an exceptionally high degree. The overall bacteria reduction in the effluent is from 80% to 90%. Sterilization of the finished water can be accomplished with much less chlorine. This results in reducing consumer complaint due to chlorinous tastes.
3. Turbidity less than 5 P.P.M. can easily be maintained at all times even though the raw supply fluctuates greatly. Channeling, mud balling and other common sand filter shortcomings are never a problem.
4. Operating cost compares favorably with conventional sand.

Less than 0.2% of water is required to sluice and clean the Model SCJ filter. The largest filter units can be cleaned and a new fresh diatomite pre-coat applied and the filter back in operation in 20 minutes or less.

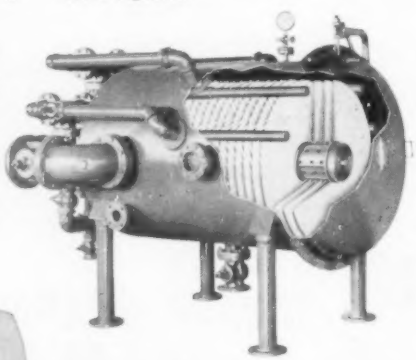
Operators can be easily trained to handle this filter, no highly skilled specialized personnel is required to insure efficient performance.

Sparkler Model SCJ filters can supply practically any required volume of city water. Single units with a capacity of 5,000,000 gal. per day are available. Multiple units including a standby filter is usually employed to insure uninterrupted service for large volume requirements.

Modern electronic control instruments are readily adaptable to these filters, making uniform high quality water supply sure and automatic.

The startlingly low original cost, simple operation, and positive, consistent high quality filtration makes the Sparkler Municipal Water Works filtration system worthy of the most thorough consideration by water works engineers.

Interior construction of Model SCJ Water Filter. Sparkler filtration engineers have introduced, in the SCJ filter, new principles of diatomite filtering that are much superior to old methods and comprise the most advanced innovations in recent years.



SPARKLER FILTERS

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Sparkler International Ltd. with plants in Canada, Holland, Italy and Australia — Service representatives in principal cities throughout the world.

BOOKS IN BRIEF

ELECTRICITY FROM THE WIND

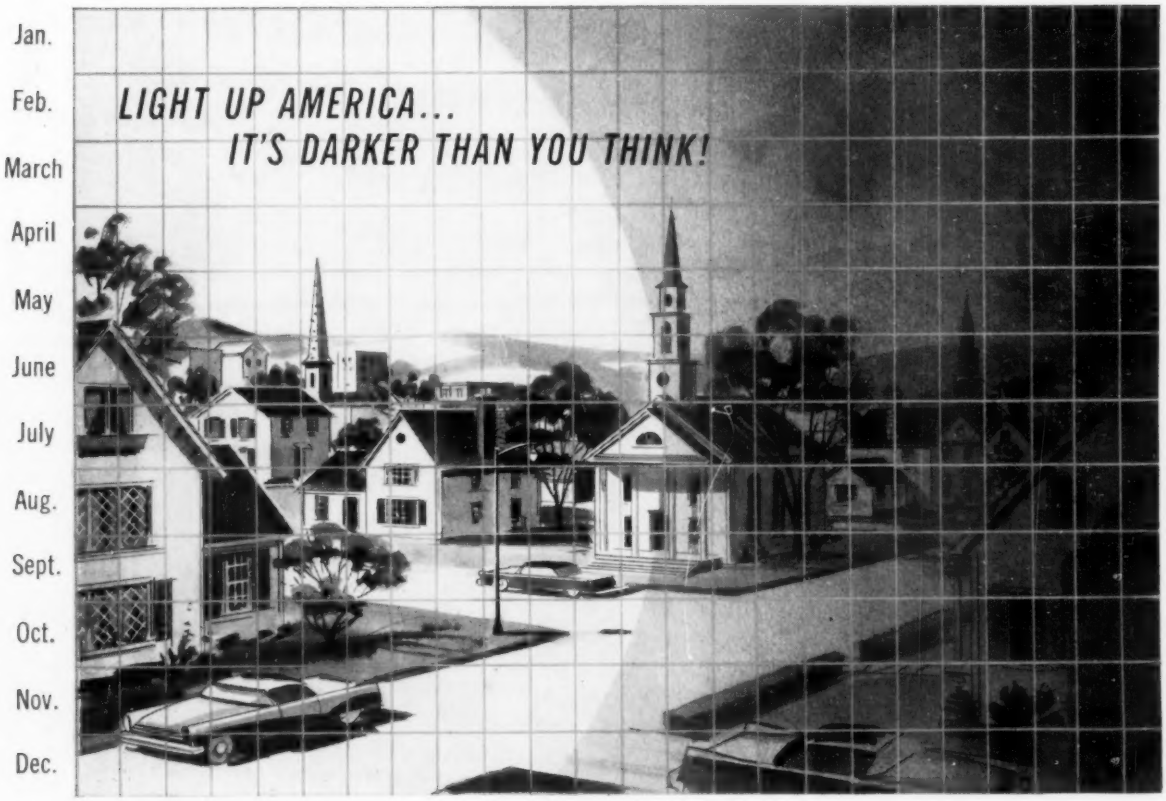
This is a thorough and complete text on the production of power from the wind. Since power needs are great in nearly all undeveloped parts of the world, and wind may provide the cheapest source of such power, the information in this text will be of special value to all interested in overseas underdeveloped areas. The text is technical and deals with procedures in making wind surveys to select suitable sites; with the structure and behavior of the wind; and with techniques for measuring it. It also considers in detail the economy of wind power in relation to large public power supply networks as well as with isolated installations. 310 pages; well illustrated; $12. E. W. Golding is the author; the publishers are Philosophical Library, Inc., 15 E. 40th St., New York, N. Y.

JOINT SPACING IN CONCRETE PAVEMENTS

This publication contains reports on six experimental concrete pavement projects covering a 10-year period of study. It describes the condition of the pavements in six states and presents data collected up to the present time. The studies cover joint spacing in plain and reinforced concrete pavements. Copies are $2.70 and are available from Highway Research Board of the National Academy of Sciences, National Research Council, 2101 Constitution, Washington, D. C.

THE DESIGN AND CONSTRUCTION OF ENGINEERING FOUNDATIONS

Presenting current practice and possible future trends in the design and construction of engineering foundations in Great Britain and the United States, this book covers geology; soil mechanics; mining subsidence; individual, continuous, and raft footings; piers, piles, retaining walls, bulkheads, culverts and moving structures. One hundred design problems in planning, analysis and detailing of foundations are included. The author is F.D.C. Henry, McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. are the Publishers. Price is $9.00 per copy.



How does your town plan to combat darkness?

In five out of six communities, shopping and residential streets which are pleasant and inviting in the daytime become dark and unattractive when night falls. "Horse and buggy" lighting cuts down the hours of business, reduces social activity, keeps away visitors, and sets the stage for juvenile delinquency, crime, and accidents.

That's why hundreds of civic leaders across the nation are sponsoring good lighting in their towns. Adequate street lighting has already proved that its benefits far outweigh its moderate cost. Brightly lighted shopping streets act as a magnet, pulling buyers from miles around. Community life is quickened when streets are safe for pedestrians and drivers. Crime is reduced. Nighttime accidents are fewer.

People know that the well-lighted town is a progressive town—a good place to live and to establish business and industry. Why not find out how much good lighting can do for your community?

"Out of Darkness," a new, dramatic film story of how one community met its street-lighting problems, is now available to civic groups, community service organizations, etc. This 16-mm, sound, black-and-white movie runs 26 minutes. Borrow a print of "Out of Darkness" from your nearest G-E Apparatus Sales Office.

Section M455-12
Outdoor Lighting Department,
General Electric Company, Schenectady 5, N. Y.

Please send me a free copy of the 24-page bulletin, "Light the Way to a Better Community," GEA-6047.

Name_____

Street_____

City and State_____

Progress Is Our Most Important Product

GENERAL ELECTRIC

from WESTERN CITY, *August, 1956*

Sewage Treatment Costs and Odors Reduced By Santa Barbara System

By HARRY A. TOW
Former Public Works Director
and
RUSSELL B. KEELER
Supt., Sanitation Div.

SIGNIFICANT steps were recently tak- to solve sewage treatment cost and or problems in the city of Santa Bar- ra. A series of operational changes ve been culminated by successful prog- ss, thus far, in experiments conducted ith a reodorant chemical spray pro- o mask plant odors.

Sewage arriving at the city's t plant has been slightly septic, phide content of ½ to 1 pa during summer. Plant ef content has averaged on per million due largely at approximately ½ d a resulting long dete chlorination has, unti essary in order to con postchlorination dos er than normal in Prior to the initiatio duce sewage septici costs, with the coro reduction, complain commercial propertie mon.

Steps taken thus costs and odo

excess sufficient air an aerobic proce culation significantly ides have thus been re there has been a significant odor production caused b ical effect of air bubbles the preaeration section.

2. During summer tank of the city's tw settling tanks is theoretical de two and sulphid

4. Digester supernatant has been re- turned, whenever postchlorination is not in progress, to the plant outfall rather than to the settling tanks, thus reducing septic action of sludge in settling tank hoppers.

5. Routine cleaning of the city's sewer system with sewer balls has been initiated in lieu of the inadequate flushing pro- gram previously in effect, and a wet-well maintenance [illegible] been under- take[illegible] on

costs of the chlorine and Alamask, con- sidering chemical costs only, are approxi- mately $12.20 per day for chlorine (175 lbs. at $0.070 per lb.) and $11.80 per day for Alamask (16 lbs. at $0.74 per lb.). Water consumption was approxi- mately 4,300 cubic feet per day for pre- chlorination and is approximately 1,800 cubic feet per day for reodorant.

Reodorant chemicals are being intro- duced from a water spray system located on the settling tank traveling bridges, and proportioned through a mechanical mix- and proportioning-pump system origi- installed for use in chemical pre- Two quarter-circle garden ads are used for coverage of diameter clarifier. This ntly effective against the m the tank surface and launders and weirs ry of the tank; ob- used can have little ucing substances re e and not released this point. Suffici apparently avail ant compound t rising from oth bulence (wet-we nd mask these odo cent commercial-

reodorant-masking in progress rtunity

Chemical Reodorant

In supplementation of these programs, the use of three to six parts per million of chlorine for prechlorination odor con- trol has been replaced with the use of a reodorant chemical spray system on a plant scale experimental basis. Prechlor- ination was never completely effective in controlling odors and cost the city ap- proximately $16.50 per day, including the cost of chlorine and fresh water. The reodorant chemical tested thus far, Ala- mask CPM-X, has proven almost com- pletely effective in masking treatment plant odors from the point of application, he primary settling tanks, and fairly effec in masking odors from the remai lant. Present cost is app

Rhodia is sole manufacturer of Alamask® CPM-X and other Alamask odor control chemicals that effectively mask obnoxious malodors emanating from sewage systems, incinerators, dumps and industrial wastes.

Our technical service department will be happy to assist you in controlling the odor problems in your community. Please call on us.

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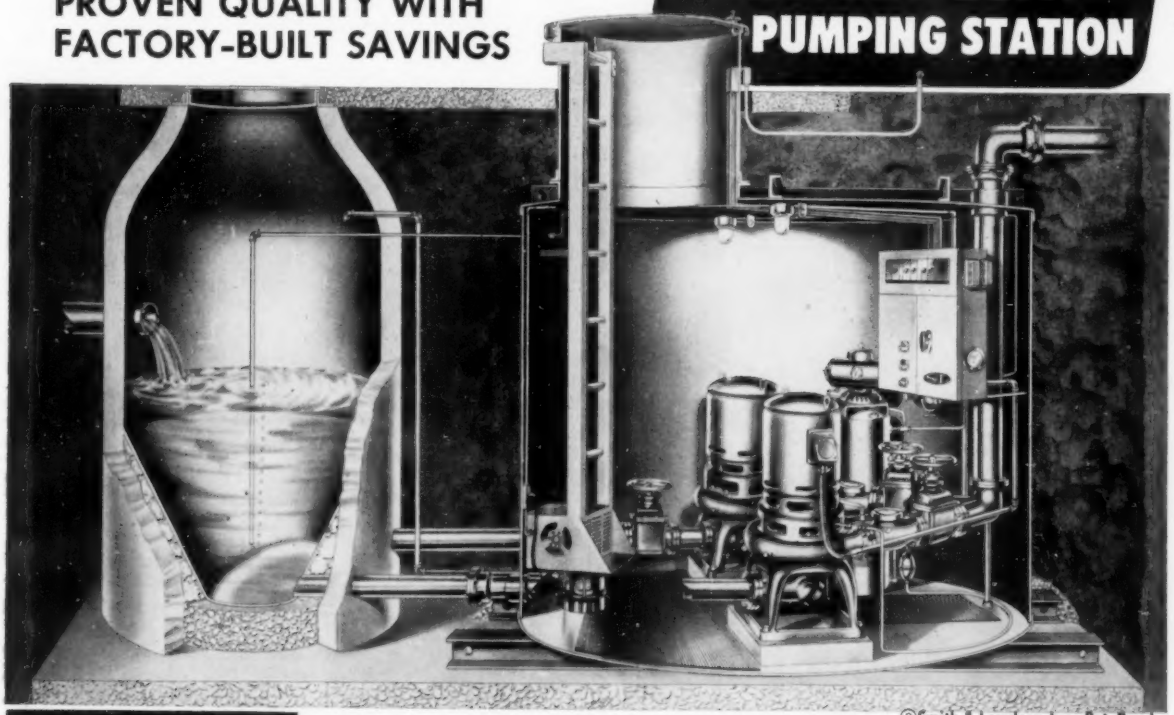

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REPRESENTATIVES IN PRINCIPAL CITIES

Dodson's Digest

Glenn Forbes gets the best of a snowman

Ran into Glenn Forbes the other day. Glenn looked a little worried for a county road commissioner riding the crest of a successful road-building program.

"Tell me, Dod," he said, "what do you know about psychoanalysis?"

"Very little," I admitted. "Why?"

"I had a strange dream last night," Glenn explained. "I was tied to a stake, and a snowman kept shooting little pellets of ice at me."

"That's easy to explain," I said. "With winter coming on, you're worried about icy roads, and . . . "

"That must be it," Glenn broke in. "I have been a little worried . . . maybe I'd better see a psychiatrist."

"The *best* thing to do is get in a supply of Calcium Chloride pellets for your ice-removal operations," I advised him.

"Why *pellets?*" Glenn wanted to know.

"Calcium Chloride pellets are practically anhydrous," I explained, "so when they go into solution, a lot of heat is generated – up to 200 degrees, in fact. This extra heat melts the ice faster!

"What's more," I went on, "Calcium Chloride pellets bore right through the ice, forming a solution that spreads *beneath* the ice, breaking it up and making it easier to clear away."

Glenn agreed the pellets might be worth trying, so the next time I saw him I asked if they had done any good.

"Not a bit, Dod," he replied, sadly.

"You mean they didn't do a good job on your roads?" I asked, amazed.

"Oh, they did a wonderful job of removing the ice," Glenn assured me, "but I'm still having those dreams. The other night I dreamed that *the snowman* was tied to the stake, and *I* was shooting Calcium Chloride pellets at *him!*"

— L. D. DODSON

P.S. — You'll want to find out about Calcium Chloride pellets for *your* ice-removal operations, too. All the facts are in our new booklet, "Pellets . . . a New Form of Wyandotte Calcium Chloride." To get your free copy, just drop me a line. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

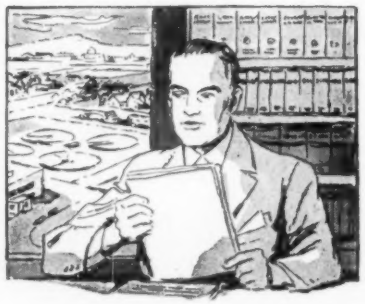
Wyandotte

CHEMICALS

MICHIGAN ALKALI DIVISION

HEADQUARTERS FOR CALCIUM CHLORIDE

LEGAL ASPECTS OF PUBLIC WORKS



MELVIN NORD,

Dr. Eng. Sci., LL. B.

Decimation

The Lemoge Electric Corp. has recently learned a lesson which can be a lesson to us all, namely that arithmetic is still important, especially decimal points.

In *Lemoge Electric v. County of San Mateo,* 297 Pac. (2d) 638, a California case decided June 6, 1956, the company submitted a bid for $172,421 for electrical work to be done at the county hospital. This bid was found to be the lowest, and, when the County announced that the bids of other contractors ranged from $197,500 to $222,700, the company realized that some material mistake had been made in the preparation of its bid. The contract was not awarded at that time, the County having reserved a 30-day period in which to act. Prompt investigation by the company revealed in its work sheets the cost of certain materials amounting to $10,452 had inadvertently been listed by a clerk as $104.52. This mistake, considered with the applicable sales tax and "mark-up" for overhead and profit, resulted in an understatement of bid in the amount of $11,744.39. When the mistake was discovered, the company immediately notified the County and furnished it with work sheets and adding machine tapes showing the error. However, the company did not attempt to rescind its bid, but simply sought an adjustment. With knowledge of the mistake and what caused it, the County accepted the erroneous bid and attempted to bind the company to the consequences of its error, refusing to make any allowance or adjustment.

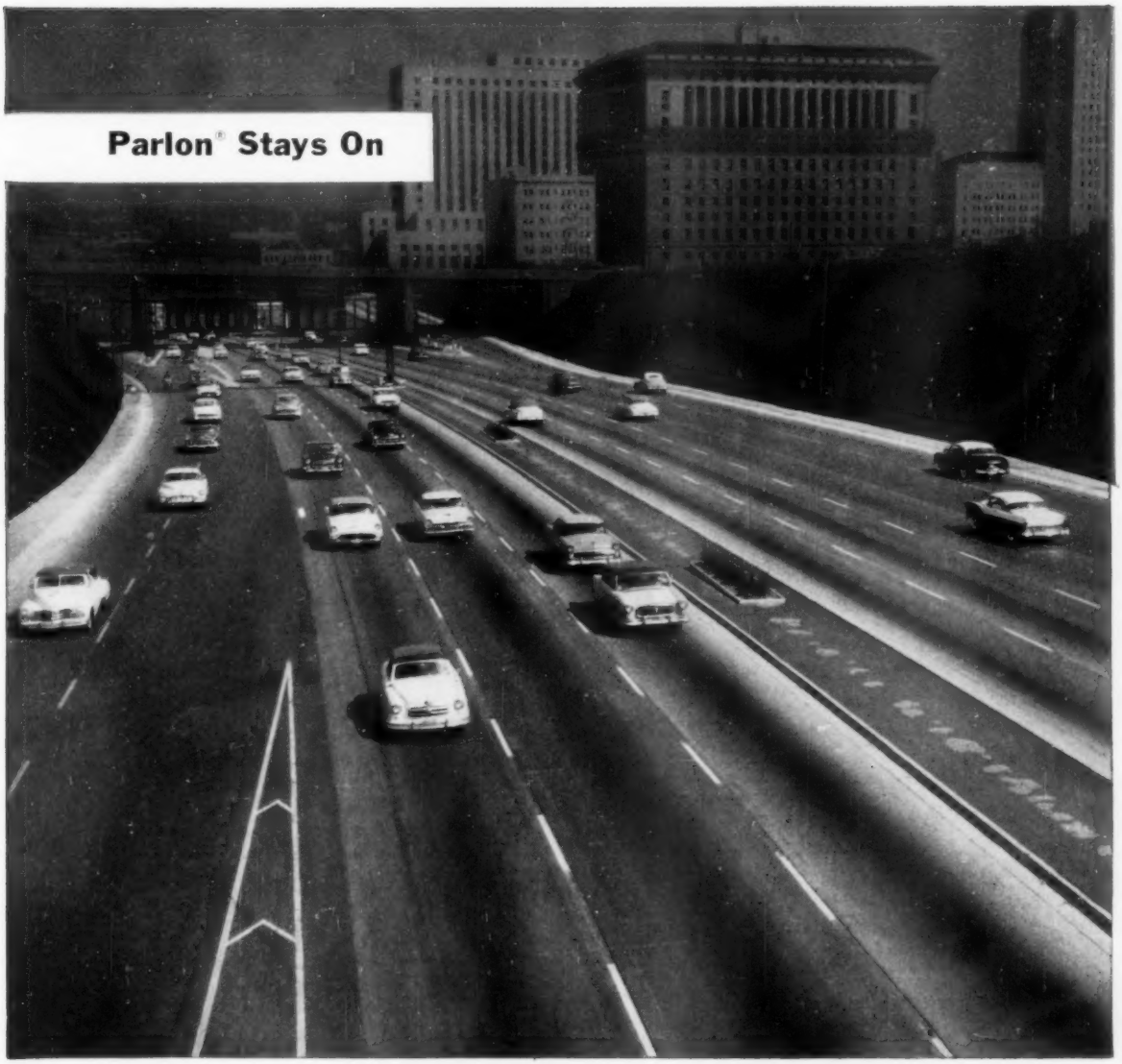
The company signed the contract, apparently fearing it would otherwise forfeit its bond. It performed the work, and then sued to reform the contract to add on the amount of $11,744.39.

This case contains a number of interesting points. In the first place, when a party knows that he has received an erroneous bid, he normally has no power to accept it. It was formerly said that there was "no meeting of the minds" in such a case. Now we are less metaphysical and say that there is no "agreement" under the objective rule,—according to which rule a person cannot accept an offer if a reasonable person in his position would know it is erroneous. Therefore, in most situations of this sort the "owner" cannot force the bidder to enter into a contract because the "owner" has no power to accept the offer. However, in the present case, the court said that the offer was *irrevocable* once it was "opened and declared". Although the purpose of the bidder's bond is to attempt to ensure that he will not revoke, the general rule is that he has the right to revoke at any time before his bid has been *accepted*, since he has received no consideration for his bid,—and that his bond will not be forfeited if he exercises that right. This rule is, however, subject to the exception that by statute, bids for *public works* are frequently made irrevocable. That was the case here, and as a result, the County had the power to accept the bid despite the fact that it knew of the error.

Furthermore, even if the County had not had this right, then "acceptance" of the bid by the County would at least have been an offer to the company to enter into a contract, which offer the company accepted by signing the contract.

The company does not deny that there is a contract, but says it should be "reformed" or corrected for mistake. As the court said, however, it is impossible to "correct" a contract to which the parties agreed, into one to which they did *not* agree. As a result, it is very clear that reformation could not be granted in this case.

The company also urged that, in the alternative, the contract be rescinded for mistake. Unfortunately for the company, however, it is too



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late for it to rescind now. Actually, it had a good ground for rescission when it first discovered the mistake, and it could have rescinded without forfeiting its bond. However, as is always the case when one has a right to rescind, he also has the alternative right to affirm the contract instead of rescinding it. By signing the contract and performing it, the company obviously elected to affirm, rather than to rescind. It is bound by this election, since at law as elsewhere, you cannot have it both ways.

Finally, the company urged that it ought to receive quasi-contractual recovery for what it "gave for nothing." Otherwise, said the company, the County would be unjustly enriched. However, the court refused this too, for the obvious reason that there can be no quasi-contractual recovery by a plaintiff who was bound by *contract* to do the acts for which he now seeks additional compensation.

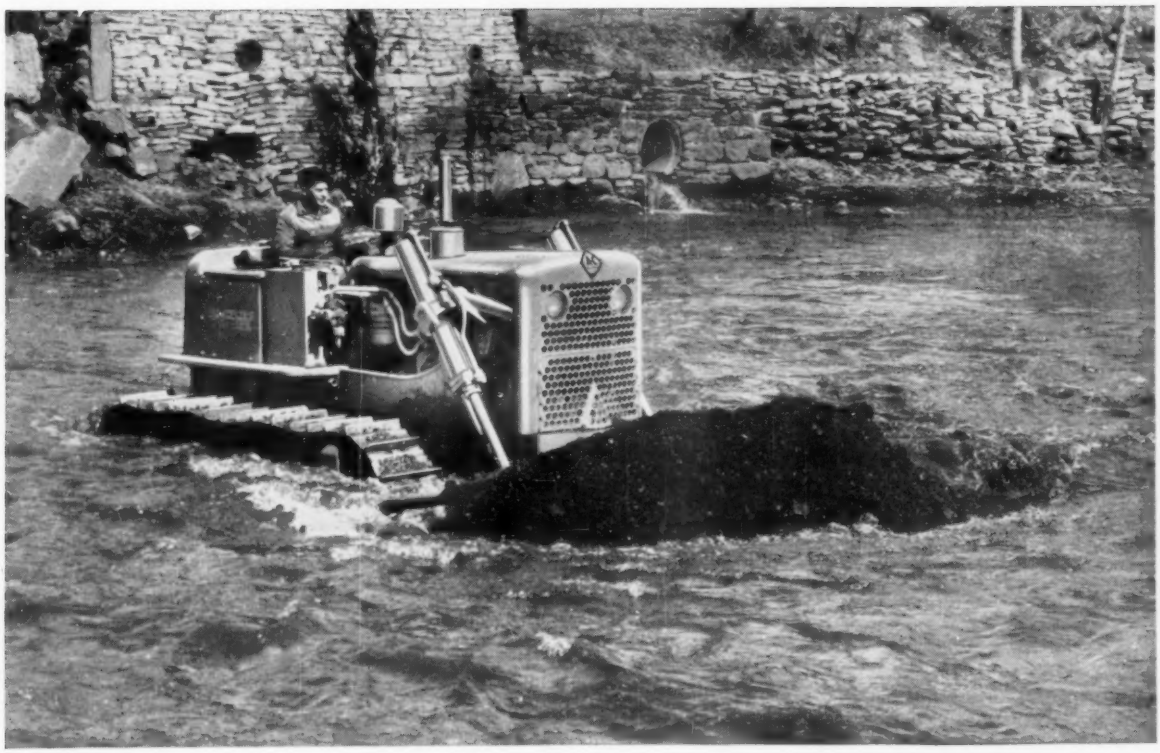
As a result, the company is out $11,744.39,—the result of a decimal point error and of a failure to take advantage of what it *now* is told it could legally have done before.

Fire in the Powder Room

Raimirez v. Ogden City, 3 Utah (2d) 102: 279 Pac. (2d) 463 (Jan. 26, 1955), raises the question of whether a municipality is immune from suit for negligence in connection with its operation of a community recreational center.

Mary Ramirez sought recovery against Ogden City for personal injuries sustained when her rayon dress came in contact with an unprotected gas heater and caught fire in the ladies' powder room of the Ogden Wall Street Community Center. The City owned and operated the Center, spending $6000 to $8000 per year on its maintenance and operation. The "enterprise" is operated exclusively as a public recreational center, everyone being free to use it. On the evening in question, the Center had been rented for $15 to the Havana Club, which was giving a dance there. The Havana Club charged 75 cents admission.

The court held the City to be immune, as this was a governmental, rather than a proprietary function. The Court stressed the fact that the Center was used as a public service for the general public, and that no income was derived from it, except nominal fees which did not pay expenses. The fact that the Center had been "rented" to a private Club the evening of the accident was held to be irrelevant.



Restoring river bed after heavy flood requires track-deep operation in water and silt

Positive Seals in Allis-Chalmers HD-11B tractor effectively keep out damaging dirt and water

Considerable work was required in Scranton, Pa., recently to restore the Lackawanna River bed and banks after a disastrous flood had caused waters to rise 15 to 20 feet above normal. Channels had to be cleared, creeks widened, dikes built on river banks and, in some places, the river even had to be changed back to its original course.

Restoration work was carried on by Sweeney Brothers, Scranton contractors, under the direction of the Pennsylvania Department of Forests and Waters. Key machine on one phase of the project, an Allis-Chalmers HD-11 tractor-bulldozer, often worked track-deep in water and silt while clearing channels of mud and wreckage. The dozer also maintained roads for the fleet of seven trucks hauling material from the river.

The HD-11B proved to be an ideal machine for this job, according to Thomas J. Collins, Sweeney Brothers president. "This is our first piece of Allis-Chalmers equipment and I'm happy with it. The unit has been subjected to very tough conditions and has stood up well. Considerable saving has been made because Allis-Chalmers 1,000-hour lubrication seals keep dirt and water out of truck wheels, rollers and idlers."

The spring-loaded *Positive Seals* that permit 1,000-hour lubrication on truck wheels, idlers and support rollers are only one of the many outstanding features of Allis-Chalmers tractors.

HD-11B

94 belt hp • 24,800 lb (approx.) as shown

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

Rock Salt . . . and Today's Roads

by **INTERNATIONAL SALT COMPANY, INC.**—America's largest producer of salt

3-Year Survey Shows Why Rock Salt Is "Best" for Ice, Snow Removal

Early this year, the Civic Affairs Committee of The Engineering Society of Detroit completed an exhaustive study—"The Use of Salt for De-Icing Streets." Over three years of intensive work by 14 outstanding engineers went into this study—which covered representative cities across the country. Their final report is now considered to be the most authoritative ever published on the subject.

Here are some of the highlights of this important report:

Public safety—and economics. According to studies made in Detroit, severe winter storms in this city could produce staggering financial losses. Employee lateness would cost $55 million a year . . . retail sales would drop $26 million a year . . . trucking losses would be $7 million annually . . . and this does *not* take into account huge losses from accidents, damage, decreased factory output, etc.

However, the use of rock salt in Detroit for immediate removal of ice and snow *prevents* these losses from occurring. And at very little expense, compared to the economic benefits to the community. For these reasons, The Civic Affairs Committee concludes: ". . . use of rock salt is by far the best procedure, and is in the best public interest. . . . It is a 'modern' program geared to the problem of keeping an urban community operating in spite of adverse winter weather."

Effect of rock salt on cars. Studies were made in 12 different states in order to determine corrosive effects of rock salt on car bodies, bumpers, fender welts, etc. (The three major automotive manufacturers were represented on the Committee in this work.) According to the evidence collected, The Civic Affairs Committee states, "The enamels and lacquers used on autos today are relatively unaffected by salt used on the street to melt ice and snow. Only when the finish is broken in some manner, allowing the brine solution to reach the underlying steel, will corrosion start."

Corrosion inhibitors. The Civic Affairs Committee also investigated so-called corrosion inhibitors. Their findings indicated: ". . . the use of inhibitors in salt is of doubtful value in protecting the exterior appearance of autos." It was also reported that "inhibitors are unable to prevent corrosion of susceptible parts of autos."

Effect of rock salt on utilities and other structures. In this study, the Detroit Edison Co. and the Michigan Bell Telephone Co. presented evidence to show that the economic benefits of using rock salt far outweighed any effects it may have on their equipment. "In general . . . the problems of the electric utility are not measurably increased by use of salt in de-icing streets." Also, the effect of salt on telephone utilities "appears to be of a low order of magnitude and is readily handled by normal maintenance procedures."

As far as street or highway surfacing is concerned, these general observations were made: Rock salt does not harm black top (bituminous and asphalt), natural stone, and air-entrained cement surfaces.

FREE COPY of the complete Civic Affairs Committee report—"The Use of Salt for De-Icing Streets." A *must* for every official concerned with highway safety, traffic, maintenance—and practical economics. Fully documented, with graphs, charts, references. For your copy, write International Salt Co., Scranton 2, Pa.

STERLING SALT FOR ICE AND SNOW CONTROL

When you set up this winter's program for ice and snow control, be sure to check with International Salt Company—makers of famous Sterling Rock Salt. One of International's skilled and experienced "Salt Specialists" will help you set up an effective, low-cost program for *your* roads and streets. He'll show you actual examples of how Sterling Rock Salt has worked to speed removal of snow and ice. And he'll give you complete details on ordering, storing, and applying this quality salt product. Just contact your nearest International sales office.

JUST 7 MINUTES after Sterling Rock Salt was applied—this U.S. Highway is clear and open! Traffic is moving safely despite the snowfall. On this highway—as on many others—tests have shown that just one truckload of Sterling Rock Salt covers as long a stretch of road as five truckloads of abrasives. And with this rock salt, spring cleanup expense is eliminated.

IMPORTANT NEWS: Now you can store your rock salt outdoors—and still have it free-flowing when winter storms hit! A newly developed chemical agent, Sterling *Sorite*, actually prevents rock salt from caking. It eliminates the need for costly structures to protect salt from weather . . . permits economical early ordering. Amazing new *Sorite* is low in cost, easy to apply. Be sure to specify Sterling *Sorite* with your order of Sterling Rock Salt. It's available now—shipped in 50-lb. drums.

Sales Offices: Atlanta, Ga.; Chicago, Ill., New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Philadelphia, Pa.; Cleveland, O.; Pittsburgh, Pa.; and Richmond, Va

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Built to "take it," this low-cost Barber-Greene Ditcher cuts the cost of digging narrow trenches . . . proves that hand digging is no longer economical, even on the smallest jobs.

Digging from house to main at less cost than ever before

When laying pipe for service lines and other installations, utilities and contractors have had to contend with the high cost of digging and backfilling the required trenches.

The new Barber-Greene 702 Ditcher has solved this problem. Despite its small size, the 702 is the newest machine in the most rugged line of ditchers made.

Prior to this new development, available machines either dug too wide for practical and economical operation, or did not have the stamina and digability required for coping with unfavorable conditions.

Utilities, contractors and railroads are now gaining the advantages of underground lines and services in virtually every area of the country.

Applications, to date, include electric power and telephone lines and house services, railroad signal systems, traffic control systems, outdoor theater wiring, installations of small gas and water lines and services, lawn sprinkling systems and others.

Digs to 40" deep, 5" wide. The 702 can be easily towed or carried on a light truck. Simple-to-operate dual controls permit operation from seat or from side of machine for full view of trench.

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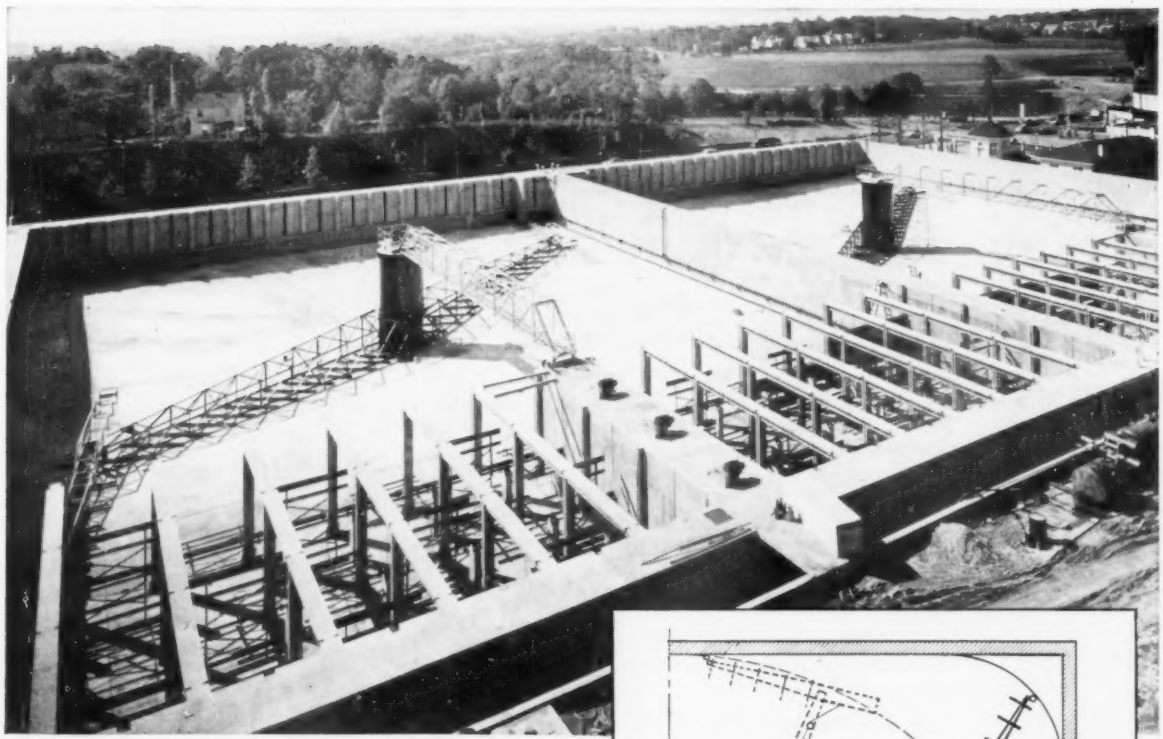
LINK-BELT supplies Baltimore's Ashburton filtration plant with

circular collection in square tanks



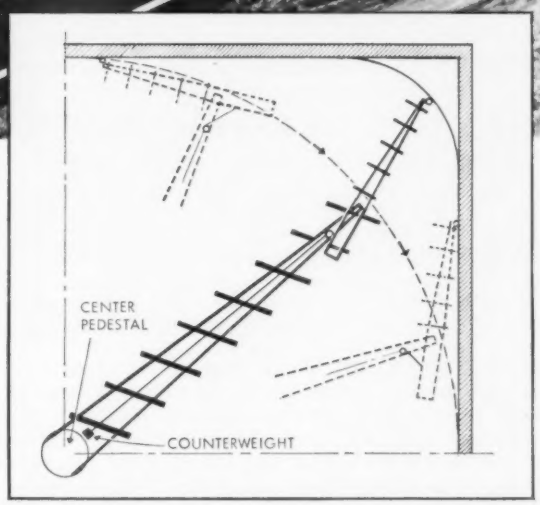
LINK-BELT "SC" CIRCULINE SLUDGE COLLECTORS are shown in two of four tanks at Ashburton plant. As arms revolve, scrapers move settled sludge toward sump in center of tank. Link-Belt Straightline slow mixers are in foreground. The Arundel Corporation, Baltimore, general contractors; Mr. B. L. Werner, City Water Engineer.

Design permits efficient sludge removal with economical tank construction

Chief advantage of rectangular settling tank design is the savings it offers in wall construction and piping costs. In addition, unit construction with slow mixers gives uniform distribution in the settling tank and prevents floc break-up. By choosing rectangular tanks with Link-Belt "SC" Circuline Collectors, the city of Baltimore, Md., was able to combine the benefits of both at its Ashburton water filtration plant.

Link-Belt has pioneered many advances in sanitary engineering. Today, 35 years' background and a broad line of built-to-last equipment support every Link-Belt recommendation.

A call to your nearby Link-Belt office will put you in touch with a treatment specialist. He's ready to work with your consultants and chemists . . . bring you the finest in modern equipment, for any water, sewage or industrial waste treatment requirement.

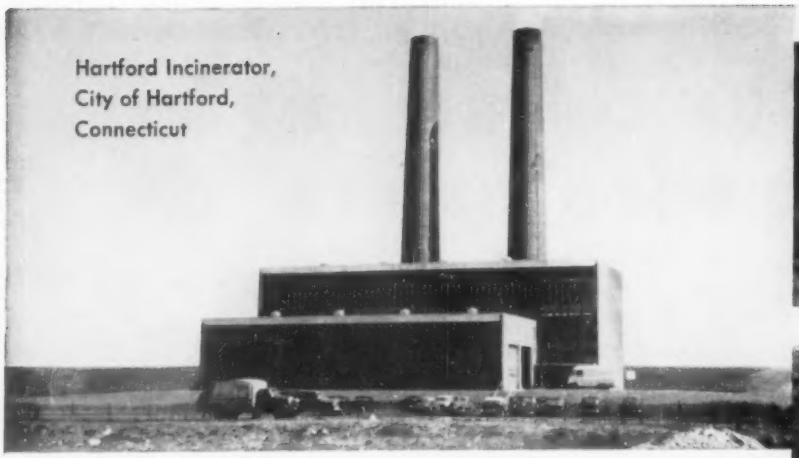


RAKES attached to collectors at each end have wheels which roll along metal curb around bottom of basin. Cable and counterweight assure constant rake contact against guide curb.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.214



Hartford Incinerator,
City of Hartford,
Connecticut

(1) Hartford's Fitchburg Chipper

(2) Fitchburg Chipper in action

Modern Hartford disposal plant uses FITCHBURG CHIPPER

Hartford's new municipal incinerator is used to dispose of more than 400,000 pounds of waste every day. The large picture above shows this efficient, attractive plant—one of the most modern in the nation.

An important part of Hartford's up-to-date disposal program is their portable Fitchburg Chipper, which cleans up disposal jobs the incinerator cannot handle, and goes out on location for road use.

Hartford had these problems:

• *Banana Stalk Disposal* • *Brush Disposal on New Roads*
• *Christmas Tree Disposal* • *Road Clearance from Storm Damage*

How a Fitchburg Chipper solves these problems:

Joseph J. Coffey, Superintendent of the Hartford Incinerator, tells you in his own words how Hartford solves these problems: BANANA STALKS: "We chip 2 to 4 tons of banana stalks each week. These stalks will not burn regardless of heat in the furnaces, and we had to dump them until the Fitchburg Chipper went on duty." CHRISTMAS TREES: "During the post-Christmas season we receive many Christmas trees which we can now get rid of without the trouble of watching for burnt-down spike-like stubs which cause much trouble with the incinerator equipment."

BRUSH DISPOSAL: "Our Highway Division has used our Fitchburg Chipper to clean up the brush and branches along newly developed road areas. By chipping brush, the city saves in use of both manpower and trucking costs." ROAD CLEARANCE: "If we get hit again by hurricanes or bad wind storms, we now have an excellent piece of equipment that will enable us to readily open up the streets for emergency traffic by reducing the fallen branches to chips."

As to maintenance, Mr. Coffey says: "Our Fitchburg Chipper will pay for itself in a very short time. Maintenance, so far, is just keeping it supplied with gasoline and fully lubricated. It is easy to handle, easy to store, and very easy to use."

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FITCHBURG ENGINEERING CORPORATION

Read what leading Fitchburg users say

LINE CLEARANCE

The Shade Tree Service Company, Webster Groves, Mo.: "Our figures show that production has been increased by a good 25% with the use of the Fitchburg Chipper. One man can operate the chipper with ease. He alone can handle as much, and more, brush in the same length of time as could two men loading brush on a platform body."

POWER COMPANY

Rockland Light and Power Company, Nyack, N. Y.: "Our men have been particularly pleased with their Fitchburg Chippers. They are rugged and reliable and the convenience of flexible, yet instant brush disposal has the advantage of promoting good public relations and still gives us efficiency."

Yours FREE "CHIPPER TALK"

Fitchburg Engineering Corporation
Fitchburg, Mass., Dept. PW1156

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Address _____

City _____ State _____

BRUSH CHIPPER *helps Maintenance in Forested Watershed*

COVERING an area of 1514 acres, the watershed of the Borough of Hanover, Pa., is well forested. On 1257 acres, 1,493,152 pines were planted more than 20 years ago, resulting in an almost complete forest cover. The area is also a game preserve, with at least 300 deer, and also wild turkey, pheasants and rabbits. Along the principal road through the area, the water department has planted multiflora rose bushes, the berries of which provide winter food for the pheasants and other birds.

Maintenance of such a forested area brought problems. The original trails through the forested area were narrow. In 1948, the US Forest Service recommended that 80-ft. wide fire breaks be cut 1800 ft. apart through all forested sections. Since burning of the cut timber was impossible, a medium-sized Fitchburg Chipper was purchased. Larger trees, above about 6-in. diameter, are sold for pulp; trees to a 6-in. maximum are chipped and the chips are left on the ground for mulch. The chipper handles the many species of pine and the hardwoods which have grown up among them equally well. All brush and trimmings are chipped. Stumps are pulled and pushed back into the woods for game protection.

There are 18 miles of these fire breaks or trails, and these are now being widened. The cleared area is disked at intervals as necessary to keep brush down and permit the passage of vehicles. One of the water department's trucks is a 4-wheel drive Willys with a fire pump and a tank mounted on the rear. There is a 2-way radio from the fire tower to a fire station at Pleasant Hill.

Hanover Water System

Prior to 1932 Hanover's water supply came from a 200,000 gallon impounding dam. Hanover is now joined, for water supply purposes, with McSherrystown Borough, Penn and Conewago Townships, with total population of about 22,300. There are 75 miles of water main in the distributing system. Actually the water system starts at the extreme South Branch of Little Conewago Creek and is impounded into the Sheppard & Myers Dam, half a mile from the Mason-Dixon Line. The reservoir has a capacity of 202,000,000 gallons.

Raw water from the impounding dam is gravity-fed to Kitmiller's Dam where, controlled with electrically-operated valves it is fed through a 36-inch reinforced concrete pipe to Clear Lake, a quarter of a mile from the filtration plant, which has a capacity of 52 mg. and is used as a settling out basin to reduce the turbidities in the raw water before it enters the filtration plant. This lake also bypasses all water in time of floods and storms. Water at the Clear Lake Dam is controlled by 5 sluice gates near the spillway. These are used only when there is insufficient water going over the spillway to supply the filtration plant.

For filtration, 7 rapid sand filters are used. These have a capacity of 3,572,480 gpd. Following chlorination, the water is treated with liquid chlorine and ammonia. Sulfate of alumina is used for coagulation. Water is pumped 4½ miles to the two Parr's Hill Reservoirs, one with a capacity of 6 mg., the other with a capacity of 8½ mg. Water is lifted by 2 electrically-driven pumps, each with a capacity of 1250 gpm. A booster pump can increase this to 1850 gpm. Four samples are taken daily from the distribution system and analyzed by Hanover General Hospital. In addition, two samples are taken each morning from each reservoir.

Consumption in 1932 was 409,037,000 gallons; in 1954 it was 722,599,600 gallons. The number of consumers increased from 4494 in 1932 to 6584 in 1954. 267 fire hydrants are connected. In 1954 average per capita consumption per day was 89 gallons. Total daily use on the average was 2-million gallons, all metered.

Administration

The Hanover Municipal Water Works is operated by a water works commission of 3 men appointed by the Borough Council and approved by the York County Courts. The commissioners serve for 3-year terms without pay. Edgar J. Masemer, Manager, has been with the water works since January 1, 1956, Robert C. McKain, is the Forester for the watershed.

HOW TO PLAN A SUCCESSFUL Landfill Program

ELDON P. KOETTER

Sanitary Landfill Specialist,

Caterpillar Tractor Co.

OVER 100 cities will adopt sanitary landfill in 1956; but we have no way of knowing how many sanitary landfills will revert to maintained open dumps in that time. What are the reasons why such an economical and satisfactory method of garbage disposal should become disorganized? To answer these questions, we should examine areas that have had an outstanding past record of continued achievement. What do they have?

First, they have competent and interested supervision. The supervisors are not always full time; many have time-consuming additional duties such as streets and roads, sewerage or entire city engineering programs. They do, however, find enough time during each week to ride a truck route, follow collectors and check in at the sites to hand out compliments or constructive criticism. This constant spot check on the city refuse collection and disposal system fosters that esprit de corps so necessary for the proper function of any organization.

Secondly, these cities have an informed public. The citizens are constantly told via newspapers, radio and TV that their city administration is saving them money in refuse disposal and eliminating a health menace. Signs mark sites clearly. Clean uniforms, trucks and tractors invite inspection and the members of the sanitation department, through their own knowledge of over-all operations and their enthusiasm, serve as a solid public relations department. Many times these sanitary landfill programs were initiated by powerful citizen groups such as Kiwanis or Lions Clubs. They have made it their business to inform and be informed and city officials should maintain that wholesome interest.

Thirdly, all of these successful cities have adequate equipment to do the job. They have regarded purchases of equipment, such as enclosed collection trucks and crawler-type tractors, a capital investment and have considered the program as permanent and not a stopgap expediency to avoid injunctions and lawsuits. Their attitude has been to equip the department adequately in the first year or two of operation and to show the public complete results in a short period of time. Too small machines or not enough of them do more harm than good as money has been spent with no appreciable results.

Another earmark of a good landfill program is proper equipment selection and application. Having a versatile machine to begin with has its advantages because it can still be used even though physical changes in the site take place. A basic rule in efficient operation is the adaptation of landfill operational practices to fit the land. This means careful initial planning to reduce tractor travel to a minimum and to eliminate unnecessary rehandling of cover material. This initial planning reduces tractor maintenance and operating costs and also enables a tractor to dispose of greater quantities of refuse and garbage.

Some of the machines, types that have been used successfully on many landfills throughout the world and their application characteristics are:

Tractor-Front End-Loader for use where loads must be carried a short distance and where overhead loading of trucks is necessary.

Tractor-Bulldozers are excellent where much land clearing and preparation is involved, where the high-lift feature of the loader is not needed and where carrying of the load is not necessary.

Tractor-Bulldozer-Scraper is economical where much excavation is to be done, where large quantities of refuse are involved, where seasonal fluctuations might dictate extra machines during peak load and where cover material must be carried some distance.

Power Shovel or *Tractor Mounted Hystaway* is needed where low ground or marshy areas do not allow free tractor travel and where excavations greater than 8 ft. in depth are necessary in hard digging.

In many instances where cover material must be hauled from stockpiles and the city cannot establish a definite need for a crawler drawn scraper, a used truck has been purchased to operate on the landfill site hauling cover material from stockpile to working face. By this method, a front end loader and truck can handle large quantities of material in a short period of time. This also greatly reduces maintenance costs on the front end loader which is not usually designed for efficient long hauls.

An earmark that is coming to mean more in sanitary landfill and in every other phase of public administration is a method of cost accounting. Some governmental bodies have elaborate systems; others have almost none. An accurate method of costing gives a substantial guide to future purchases and may save cities many thousands of dollars. Here is a sample outline that may establish accurate cost per ton of refuse and garbage disposal:

Assume a city of 35,000 population from which a total of 22.356 tons of refuse per year may be expected on the basis of 3.5 pounds production per person per day. A land site of 3.5 acres should be provided which, at $450 per acre, will cost $1575. This cost should be prorated over the life of the site; in many cases, the land after filling will sell for more than it cost.

Equipment depreciation should be based on 10 percent per year; or for this city, with an assumed cost of $20,000 for equipment, depreciation would be $2,000 per year. Fuel, oil, grease and repairs will also probably aggregate $2,000 per year. Small tools, storage building, fence and similar items will usually be covered by an expenditure of $200. Direct salaries for fill operation should amount to about $5,200 per year; and part time supervision of filling operation about $2,000. The total is $12,975, or about 58 cents a ton (for disposal only, not including collection) based on the estimated production of 22,356 tons annually.

"SUCCESSFUL CITIES HAVE ADEQUATE EQUIPMENT TO DO THE JOB"

● **HARD DIGGING** conditions at this Los Angeles sanitary landfill location are overcome by this tractor-ripper team. This is one of six D8's owned by the B.K.K. Company, Inc.

● **CITY-OWNED** motor grader is used to finish grade on an old sanitary landfill site in Long Beach, California. Below this grader is 25 feet of compacted garbage and refuse.

● **CRAWLER-SCRAPER** combination spreads earth cover on a compacted fill at Memphis, Tennessee. A large volume of refuse is handled by this city's excellent landfill program.

● **VERSATILE** front-end loader can help other departments in small communities when not used full time for landfill. This Mercedes, Texas, unit loads street department trucks.

● **TRACTOR-DOZER** team is used to advantage at Burbank, California. One unit spreads and compacts refuse while the other bulldozes cover material and blankets new fill areas.

● **LAND IMPROVEMENT** values become evident when property owners request landfill to continue right up to foundation. Shown here is a fill construction project in Waterloo, Iowa.

PILINGS FOR HIGHWAY BRIDGES

J. N. CLARY

Bridge Engineer,

Virginia Dept. of Highways

PILES of various types are used in the foundations of many of the highway bridges built in Virginia. In the tidewater area of the State, which extends from the Atlantic Ocean and the Chesapeake Bay inland almost to U. S. Routes I and 301, most of our bridges are supported on piles. Between the Tidewater area and the Blue Ridge Mountains, piles are frequently used where the depth to rock or other suitable foundation is too great for economy.

There are four types of piles generally used in Virginia — timber, cast-in-place concrete, precast concrete and steel H-piles. Timber and precast piles have been used for many years while steel H-piles and cast-in-place piles have been specified only during the past ten years.

Timber piles have been most widely used in the past because of the lower first cost. Wherever the piles are underground and entirely below the permanent water table untreated piles are specified. In such cases piles may be of any species that will satisfactorily withstand driving. Untreated piles, if used in exposed work for relatively temporary construction, are required to have the diameter of the heartwood not less than 80 percent of the required diameter of the pile.

When timber piles are used under other conditions they are treated with creosote oil generally in accordance with the Standard Specifications for Highway Bridges of the AASHO. In salt water subject to attack by marine borers a 20 pound full cell treatment is specified. For normal land use a 12 pound empty cell treatment is used. The full cell method with 16 pounds of creosote oil per cubic foot is required when used in running water either fresh or slightly brackish.

Where dictated by soil conditions, steel shoes are specified to secure adequate penetration and proper bearing. This is never necessary in tidewater but as we go further west occasional small boulders or river jack may be encountered, making shoes advisable. They are also used to penetrate weathered rock in some cases.

Timber piles are required to have a minimum diameter at the tip, measured under the bark, as follows: For piles less than 40 feet long, 8 ins.; 40 to 60 feet, 7 ins.; and over 60 feet, 6 ins. For Southern Yellow Pine, Douglas Fir or Southern Cypress, the minimum diameter of piles at a section three feet from the butt, measured under the bark, is required to be 11 ins. for piles 20 feet long or less; 12 ins. for piles measuring 21 to 40 feet; and 13 ins. for longer piles. When other woods are used, the 21 to 30 ft. piles must measure 12 ins.; 31 to 40 ft. piles, 13 ins.; and over 40 feet, 14 ins. The diameter of the piles at the butt must not exceed 20 inches.

Except in special cases, all timber piles are driven to a minimum bearing value of 20 tons per pile.

Where feasible the safe allowable load is determined by loading tests. The safe value is considered as 50 percent of that load which, after a continuous application for 48 hours, produces a permanent settlement not greater than ¼ inch measured at the top of the pile. This maximum settlement must not be increased by the continuous application of the test load for a period of 60 hours or longer. Normally at least 1 pile out of each 100 is load tested.

In the absence of loading test, the safe load for *timber piles* is determined by the following formulas:

● PILING ON THE John Andrew Twiggs Bridge over the Pianktank River.

for gravity hammers

$$P = 2WH/(S+1.0)$$

for single-acting steam hammers

$$P = 2WH/(S+0.1)$$

for double-acting steam hammers

$$P = 2H(W+Ap)/(S+0.1)$$

where

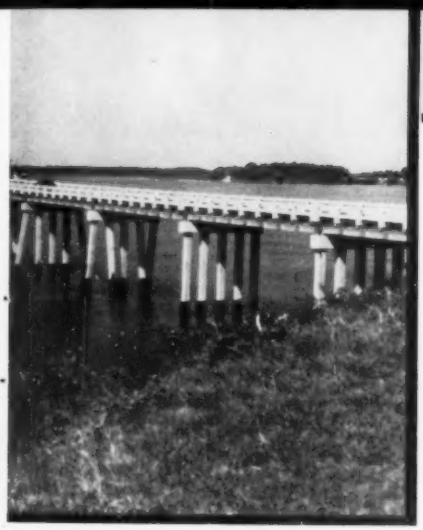
- P = safe bearing power in pounds;
- W = weight of striking parts of hammer in pounds;
- H = height of fall in feet;
- A = area of piston in sq. ins.;
- p = steam pressure at the hammer in pounds per square inch; and
- S = average penetration in inches per blow for last 5 to 10 blows for gravity hammers and last 10 to 20 blows for steam hammers.

The above formulas are applicable only when: The hammer has a free fall; the head of the pile is not broomed or crushed; the penetration is reasonably quick and uniform; there is no sensible bounce after the blow; and a follower is not used.

Twice the height of the bounce shall be deducted from "H" to determine its value in the formula.

Modifications of the above formulas have been used in a few special cases but those listed above have given satisfactory results over a period of many years and are generally adhered to.

Cast-in-place concrete piles have been used in a number of bridges in Virginia during the past several years. Cast-in-place piles are made by pouring concrete into a tapered or cylindrical form previously driven into the ground or into a hole in the

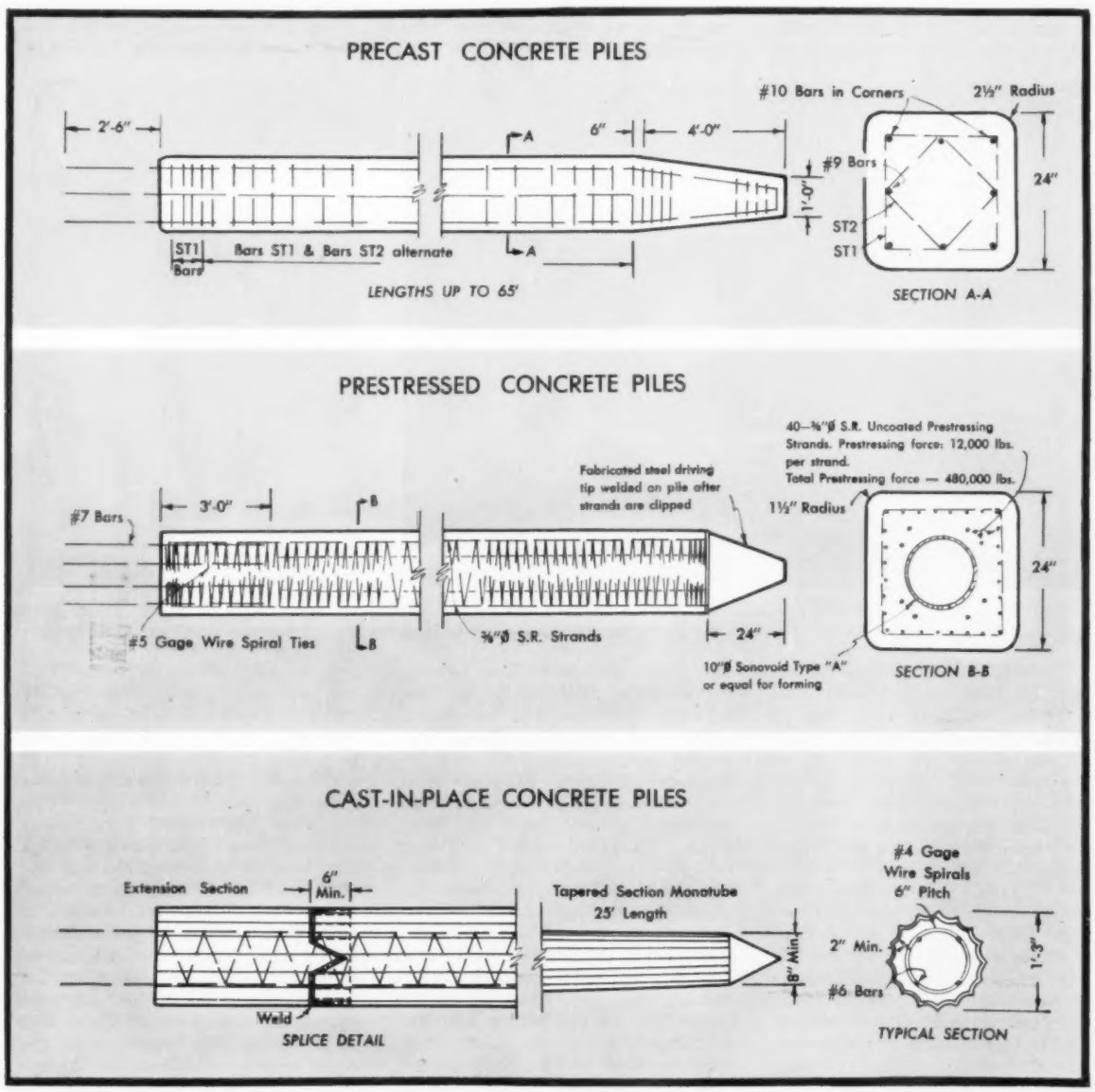


Note the water gas tar waterproofing on piles for protection at waterline.

ground from which a driven form or mandrel has been withdrawn; reinforcement is placed as necessary before pouring the concrete. The left-in-place form may be a steel shell heavy enough to be driven without a mandrel, or it may be a steel form, designed for driving with a mandrel that is removed on completion of the driving. They are used for greater permanence under certain conditions where, in the past, timber piles would have been called for. We do not at present specify cast-in-place piles where they would be exposed to salt water but for land or fresh water use and in slightly brackish water they are almost competitive with timber piles since they are usually driven to approximately twice the bearing capacity at slightly over twice the cost per foot.

On most bridges, to date, we have specified that the piles be of the fluted steel shell type as manufactured by the Union Metal Manufacturing Company. In such cases the specified minimum thickness of shell has been No. 7 gauge.

For one recent project, now under construction, we specified that "Cast-in-place piles shall be either the taper type or the closed-end cylindrical type at the option of the Contractor. One type only shall be used.



The minimum thickness of pile shell shall be No. 7 gauge, when driven without mandrel, and No. 16 gauge when driven with a mandrel. If closed end cylindrical type piles are used, each pile shall have a cast steel shoe welded to the bottom end." In this case, with an open specification, the Contractor chose to use steel pipe piles as best suited for driving with his equipment.

We normally specify that all cast-in-place piles be reinforced except for piles carrying axial loads only with adequate lateral support from the soil. That portion of the shell in excess of ⅛-in. is considered in computing required reinforcement.

After driving and prior to placing concrete in the shells all piles are inspected on the inside using a suitable light. When all piles in a group are found to be in satisfactory condition they are filled using Class A Concrete (3000 pounds at 28 days). No concrete is placed until all driving within a radius of 15 feet has been completed nor until all the shells in any one bent or group have been completely driven. If this requirement cannot be complied with, driving must be discontinued until the concrete in the last pile cast has set at least 7 days.

In Virginia, cast-in-place concrete piles are normally designed for use only as friction piles but in one stream crossing now being studied we propose to use such piles to penetrate weathered rock to reach approximately to fresh rock underneath. In this case the lower portion of the steel shell will be filled with concrete before driving.

Precast concrete piles have been used in many bridges in Tidewater, Virginia for more than thirty years. All such piles, as driven, have been square with tapered tips. They have been in various sizes from 18 ins. square to 24 ins. square and in lengths up to 110 feet.

We require that no precast pile shall be driven until it has set for at least 21 days, or longer if cast in cold weather. If it is to be used in sea water or alkali soil it must be cured for not less than 30 days before being driven. In addition, piles used in sea water must be coated with a watergas tar waterproofing compound for approximately 4 to 5 feet above and below mean tide to protect against possible disintegration.

Formerly we provided for a 2-inch bevel on all corners of precast piles but in recent years this has been changed to a 2-inch radius on corners. This appears to have reduced deterioration near the water line, which normally starts at the corners.

We have now started to use prestressed precast piles in Virginia under some conditions. They are being used in two bridges now under construction; construction of a third bridge, using these piles, will start this summer; and a fourth is now being designed and will be let to contract next fall. Approximately 43,000 linear feet of piling is being used in the 9400 feet of bridge approaches to the Hampton Roads Tunnel and approximately 21,000 linear feet for the bridge over the Pamunkey River at West Point, Virginia. Both of these projects are now under construction and all piles have been cast and practically all have been driven.

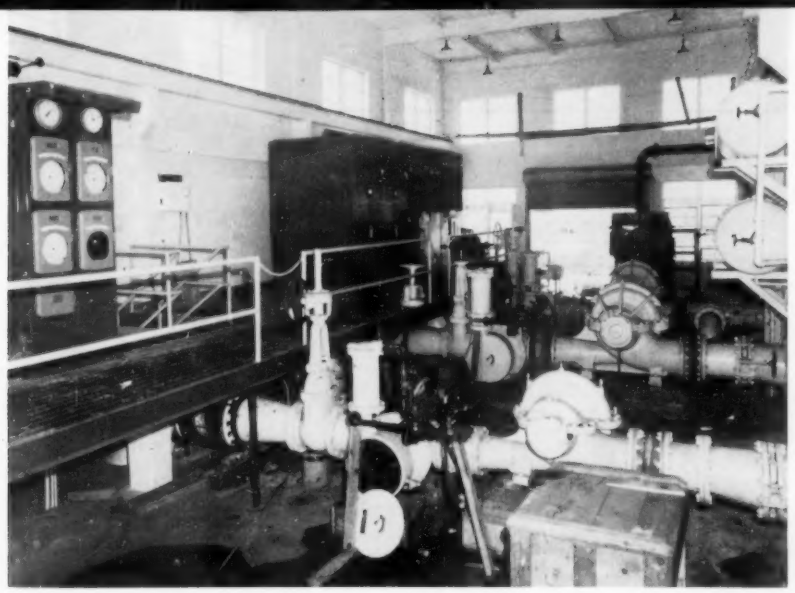
All prestressed precast piles used to date are 24 ins. square with a 10-in. cylindrical hole in the center formed by the use of Sonovoid Tubing. On the work now under construction the piles were prestressed by a pretensioned method to approximately 700 pounds per square inch. On these concrete piles we used thirty-two ⅜-in. cables, each of which was stressed to 12,000 pounds in tension. The piles were square ended with a 10-in. hole running full length. This has been modified on our newest design to provide a tapered tip closing the hole at the lower end of the pile. This was done as the result of certain difficulties encountered while driving some piles on the Pamunkey River Bridge.

The first occasion on which we used these piles was on the bridge approaches to Hampton Roads Tunnel, and no difficulty was experienced in driving. It is of interest to note that in driving test or index piles, one pile was driven, removed and re-driven ten times without any noticeable injury to the pile. On the Pamunkey River Bridge Project difficulty was experienced when a thin layer of hard material was encountered about sixty feet below the surface of the water. In addition, certain pumping through the hollow center was experienced just above this hard layer on a few piles. On both of these projects the piles were driven by a McKiernan-Terry S-8 single-acting pile hammer. In the south approach bridge to the Hamp-

(*Continued on page* 169)

● **DRIVING timber piles for a bridge approach. For normal land use timber piles are treated with creosote oil, using 12 pounds per cu. ft. and the empty cell method.**

● **STEEL H-Piles being driven with a drop hammer weighing 2500 pounds.**



● PUMPING station houses two 10 mgd and one 5 mgd pumps, plus chlorinators and control equipment. Space is provided for another 10 mgd pump when needed.

FLORIDA COUNTY

GOES 22 MILES

TO GET CHLORIDE-FREE WATER

C. E. WRIGHT

THOUGH PINELLAS County, Florida, began a water system some 20 years ago under a PWA loan and grant, growth was slow. It was hard to get water users at first. The income from water sales for the first month of operation was $121. At the end of 1937, there were 200 connections; and three years later only 1,200. After the close of World War II, water business began to boom. From 2,000 connections in 1946, the number rose to 5,000 in 1952; 6,500 in 1954; 7,700 in 1955; and to 8,800 in April, 1956, with new connections running from 125 to 150 per month.

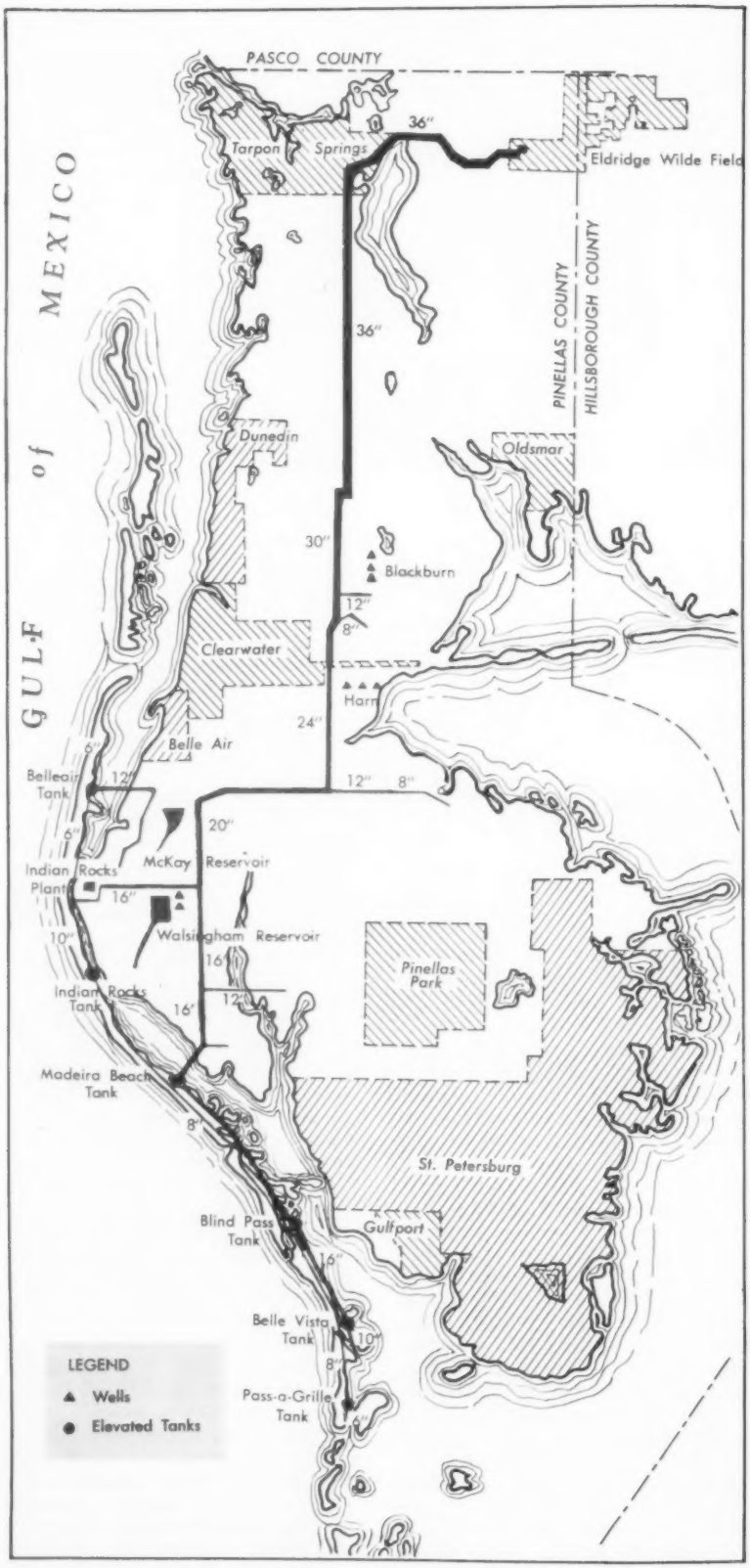
With such a rapid gain in water users, the next problem was easy to guess: An insufficient supply. Originally the water came from wells not far inland from the gulf; with the heavy water consumption and consequent overpumping, two wells within two miles of the shore developed a chloride content of 400 to 500 ppm; wells five miles from seawater increased to the range of 125 to 250 ppm of chlorides. A chloride content of more than 250 ppm affected the taste materially. A new supply appeared necessary.

About 80 percent of the land area of Pinellas County is a narrow peninsula surrounded on both sides by salt water. The Pinellas County Water System is serving all of the beach communities from Indian Rocks to Pass-a-Grille, a distance of about 25 miles; and since 1954 has also been supplying a part of the requirements of Clearwater; St. Petersburg has its own system, but also had to re-locate its wells because the old wells salted to an undesirable extent.

Other cities and towns in the county have had similar experiences. Clearwater has had to abandon several wells in recent years. A well far inland on the golf course reached a chloride content of 1068 ppm. Curtailment in pumping has brought a decrease in chloride content in some wells. Dunedin's city wells have not reached the critical stage, but probably will if pumping increases. Wells used by the Clinton Foods Co. in Dunedin have gone as high as 458, 636 and 735 ppm. Tarpon Springs, a little farther north, back in 1930 planned to get its water from Lake Tarpon and built a complete coagulation and filtration plant, but before it was placed in operation the project was abandoned because the chloride content of the lake water was excessive. Since then Tarpon Springs has depended on wells, several of which were abandoned in 1952 because of excessive chloride content. The long-range water supply problem of the city has not been solved.

A treatment plant at Indian Rocks was part of the Pinellas County system from its very beginning. As population and water usage grew, raw water reservoirs were added and new and larger pipe lines were laid. "Even before 1952 it had become apparent," say the county's consulting engineers, Black & Associates of Gainesville, Fla., "that the surface water reservoirs and raw water supply well would become inadequate for the requirements of the rapidly developing beach areas. The Board of County Commissioners was faced with the problem of locating a new source of supply which would be sufficient for the projected needs of the area. By this time the increasing salinity of the water from the wells of the Indian Rocks plant, the city of Clearwater and Tarpon Springs made it clear that their difficulties were a part of the over-all county problem.

"There were two possible courses of action open to the commission. The first was to be included in the expansion of the water program for the city of St. Petersburg; the second course of action was to develop a separate well field in the northeastern part of the county and to construct a transmission line of suf-



● **PINELLAS COUNTY water system map shows new well field and transmission mains. A 24" main extension is proposed to serve industries near Pinellas Park.**

ficient size to supply the coastal cities and the beach areas with water. This selection, by necessity, was to be based on economy and service. Before a final decision could be made, it was necessary to prove by test well drilling and other methods of geophysical exploration whether or not a well field supplying water of satisfactory quality and adequate in quantity could be developed. The county's engineers, Black & Associates, and Briley, Wild & Associates (Daytona Beach, Fla.) were instructed to conduct certain field tests and surveys and make a report to determine: (1) the availability of water supply in the northeast section of the county, and (2) the project costs and economics of operating such a proposed system."

There were negotiations with several municipalities to see whether they wanted to come into the county system. Meanwhile the immediate need for more water for the Gulf beaches required a speeding up. The engineers were instructed to investigate an area northeast of Clearwater known as the Coachman High. Surveys which had been made by the U. S. Geological Survey and the Florida Geological Survey indicated the perennial yield of the aquifer recharged by the Coachman High would be 2,000,000 gpd, and that an interim well field could be constructed until a permanent well field could be established. However, difficulties arose over rights-of-way and land acquisition so, as an alternate, another field was drilled from which a temporary supply of 1,500,000 gal. per day was obtained. Meanwhile other wells drilled in the vicinity of the Coachman High showed objectionable quantities of iron, so these wells were retained for emergency use only.

Meanwhile land approximating 1,800 acres in area was acquired in the northeastern part of Pinellas County and adjacent Hillsborough County. In that area, fifteen 12-in. wells were sunk to depths of approximately 300 ft. and were found to produce water of such excellent quality that the Indian Rocks treatment plant could be abandoned. The quantity was also sufficient, each well producing an average of a million gallons a day. This is deemed to be sufficient for projected population increases to 1985, including a contract to serve Clearwater with a minimum of 4,000,000 gal. a day at a cost of 5¢ per 1,000 gal. plus electric rate adjustment.

The field from which Pinellas County is now obtaining this new water supply is a part of the piezo-

metric contour known as the "Tampa High," an area of approximately 750 sq. mi., which has an annual recharge, from an average rainfall of 57 in., amounting to 185 billion gals. or 500 million gpd. This estimate is borne out, according to the engineers, by the enormous water flow from springs on the fringes of this "high." The nearest of these to Pinellas County is Weekiwachee Springs, which has been measured monthly since 1931. Its minimum daily discharge was 68 million gallons, its maximum 149 million gallons, and the daily average 108 million gallons over the period of record.

At the center of the Tampa subhigh, the piezometric surface is approximately 90 ft. above mean sea level. At the new well field of Pinellas County the water stands approximately 22 ft. above mean sea level. But these contours do not extend any distance into the Pinellas County peninsula, so it is certain that from this time on the Gulf beaches of that area must bring their water supply from a considerable distance. From the new well field the transporting pipe line is 22 miles long. However, Pinellas County communities are now assured of water with an excellent chemical analysis, similar to that of Crystal Springs. Representative analyses are: Total dissolved solids 166; silica, 10; iron, 0.07; calcium 52; magnesium 4.0; bicarbonate ion 170; free carbon dioxide 5.0; sulfate ion 7.8; chloride ion 5.4; and total hardness as $CaCO_3$ 146. The pH averages 7.7.

With water of this purity, a treatment plant was deemed to be unnecessary. Raw water, however, is aerated and chlorinated. Stabilization may ultimately be necessary, but this has not yet been determined.

The new well field is equipped with a pumping station which has the following equipment: One 10 mgd Peerless centrifugal pump with a Caterpillar engine; one 210-kw Caterpillar diesel driven generator set; one 10 mgd Peerless centrifugal pump driven by 500-hp. Marathon electric motors; one 5 mgd Peerless centrifugal pump driven by 300-hp. Marathon electric motor; and piping provision for a third 10 mgd centrifugal pump. These pumps take suction from a 250,000 gal. reservoir, which is used only to provide pump suction. The water is pumped from the wells to a well field collection system which feeds into a 30-in. prestressed pipe header. Chlorination is effected by a Wallace & Tiernan "Airmaster" system supplying 1,000 lbs. of chlorine a day. Two of these were purchased, one for standby use.

All wells are automatically controlled by Builders supervisory control equipment; and all other instrumentation is also by Builders. Two modern dwellings for caretakers were erected by the county on the well field property, which is a lonely area considerably removed from other habitations.

The transmission line from the field is 36-in. prestressed concrete Lock-Joint pipe, Class 150 Federal specifications. It was made at Columbia, S. C., and transported to the site by rail. Smaller transmission lines range down to 16-in. S. K. Keller, general superintendent of the water system, with offices at Clearwater, says there was a substantial saving particularly in the larger diameters of prestressed concrete pipe as compared with alternate types.

Of the nine wells near the Gulf which formerly served the Pinellas County beach area, two which were within two miles of salt water have definitely been abandoned. In these the chloride had risen to 400-500 ppm. Seven wells which are farther removed from sea water but within five miles have become stand-by wells. In these the chlorides had risen from 60 ppm to a range of 125 to 250 ppm. It is believed that with no pumping the salinity of these wells may correct itself, and they will be reserved for emergencies.

Total construction cost of the project was $2,500,000, including engineers' fees and interest on revenue certificates. The transmission main, costing $1,551,975, was the largest item. The well field cost was $232,380.

In addition to serving the beach communities and a portion of Clearwater's requirements, the Pinellas County Water System is prepared to sell water to other communities such as Dunedin, Tarpon Springs and Largo.

The overall plan for the system was worked out by Black & Associates of Gainesville and Briley, Wild & Associates of Daytona Beach. Briley, Wild & Associates supervised the piping installations and Black & Associates supervised the remainder of the project.

● **WATER from the new well field serving Pinellas County, Florida, is pumped from this station through a 36" line.**

A SAFER METHOD FOR ENTERING MANHOLES

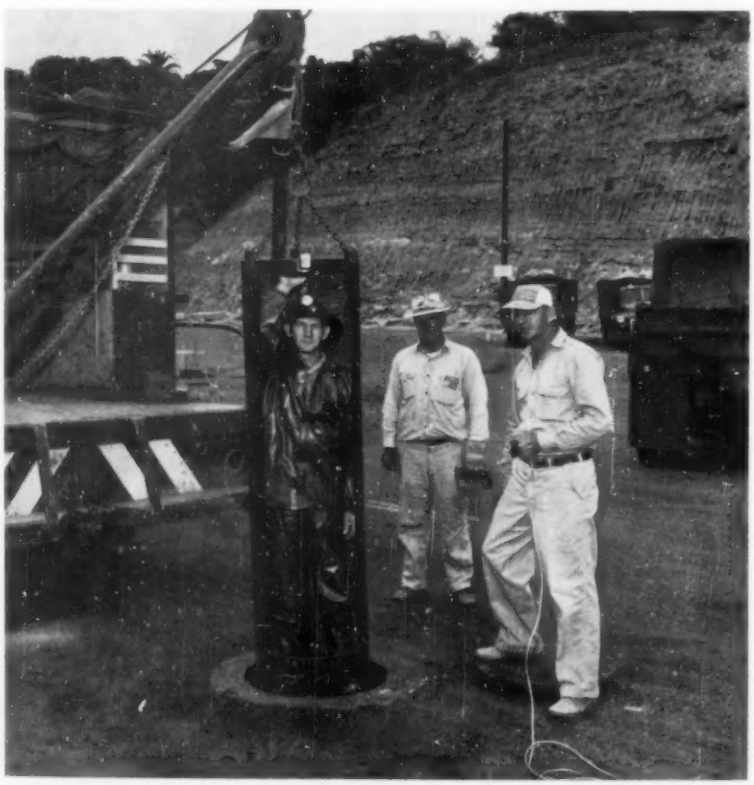
JOHN W. YORK
Senior Foreman, Sewer Division,
Department of Public Works,
San Diego, California

FACED WITH THE task of cleaning about 27,000 feet of interceptor sewer main, ranging in size from 45 inches to 60 inches, the City of San Diego, Calif., comes up with a new maintenance idea.

All manholes on this line were originally built with acid-proof brick and, due to the corrosive effect of this type of sewage, the manholes were constructed without rungs. This posed a problem for entering the manholes, since the depth of sewer invert below street grade was more than 30 feet in some instances. First, we constructed rope ladders 30 feet long and 12 inches wide. The rope ladders were not without merit, but also they were not the answer to all our problems. We found that the rope ladders were very awkward to climb up and down on, as they were always swinging around. After ascending and descending these ladders numerous times, we found that the men were hardly able to pull themselves out of the manholes due to fatigue, thus creating a situation that could have easily resulted in disaster. Furthermore, cleaning operations were materially slowed by time consumed in climbing these ladders.

In order to improve this dangerous and tiresome procedure, we designed a cage 22 inches in diameter and 6 feet high with a light mesh covering over the top and bottom, and around the sides two-thirds of the way, thus leaving one-third open for entering the cage. By using the mesh, the cage can be set into the sewage without obstructing the flow. This type of construction also allows air to pass through the cage. There is a chain welded to the top of the cage with a ring in the center for hooking the cable and safety snap hook from a boom truck, which is used to raise and lower the cage in the manhole. After a trial run, we found that the cage had a tendency to catch and hang up on the sides of the manhole. To eliminate this, curved fingers were welded around the top and bottom of the cage with the fingers curved in, thus allowing the cage to slide up and down without hanging up. It was also found that there was a possibility of a man getting his hand or arm caught between the side of the manhole and the cage, so a piece of round stock iron was welded across the top of the cage just above the man's head, for him to hang onto and keep his elbows inside of the wire mesh.

● **PROTECTIVE** manhole "elevator".



● **GOING DOWN! The author demonstrated how maintenance workers are lowered in deep, rungless manholes. Bell cord held by foreman signals truck winch operator.**

Because our standard manholes are only 24 inches across, it was necessary to limit the cage diameter to 22 inches. Experience showed that most of our men could fit the cage fairly easily.

The building of the manhole cage was only one part of our problem. After the cage was built, we then had to find a boom truck to work with it. This wasn't a problem in itself, as there were two or three such trucks in the Public Works Department, but the use of this equipment resulted in a delay in the work program of other divisions. We then looked for other uses for a boom truck in our own division to justify the construction of an additional unit. After some consideration, we found numerous ways to use the extra boom truck. Some of the uses are as follows: To lower concrete manhole cones in the construction of new manholes; handling large pipe on new construction or repair jobs; unloading flats of sewer pipe in the yard or on the job; and also bucketing dirt out of deep trenches. With these additional jobs in mind our Equipment Division was requested to install the hoisting equipment in one of our Division's trucks. We made one mistake in this installation. We installed the controls in the cab with the driver, whereas it would have been better and safer had they been mounted on the rear of the truck. However, the foreman in charge of the boom truck remedied this situation fairly well by installing a bell in the cab and a button on an extension cord with a connection mounted on the rear of the truck; then he worked out a system of signals with the operator of the winch. This enables the man guiding the operations to move about freely and transmit the orders to the operator.

The cleaning of the interceptor sewer with the boom truck and manhole cage was highly satisfactory. We were able to do more work in repairing the sewer with less fatigue to the men and with a minimum of danger. Also, we were able to lower all of our material and tools down the manholes more safely and quickly, thus keeping the men in a better spirit to do a good job.

This article is written with the thought that the procedure outlined for entering deep sewer manholes may be helpful to others. The assistance given the writer by Eric V. Quartly, Superintendent, Sewer Division, and the keen interest of Richard Gallagher, Director of Public Works, in this project are gratefully acknowledged.

TRAFFIC ROTARIES YES OR NO?

A. J. MAIR

EVERY TIME two streets come together at right angles, a problem arises. How best to get the two streams of traffic to cross each other with a minimum of confusion, delay, and danger? The heavier the flow, of course, the greater the problem, and the greater the problem the more money can be spent in solving it.

Probably the simplest method would be use of stop signs; the most complicated and expensive answer is the clover leaf, and the amount of money that can be spent on this type of intersection is tremendous.

Somewhere in between these two extremes is the traffic rotary. They take up a lot of valuable land. They can be expensive to build and they have other drawbacks, but they do seem to work.

In plan, the rotary looks like a huge wheel with the traffic flowing around the circumference, always in a counter-clockwise direction. You get into or out of the circle by way of the streets that would normally have been intersecting. The flow of traffic is guided by dividing strips and pork chop shaped islands which vary from one rotary to another.

In Edmonton, Canada the operating rule is that any approaching traffic yields the right of way to traffic in the circle. A certain amount of driver education was needed when they first went into operation, but everyone concerned was pleasantly surprised at the ease with which the motoring public caught on to the idea. The first circle went into use in Edmonton during the summer of 1953, and at this time there are nine in operation.

After a few design kinks were ironed out, traffic began to flow very smoothly. If the circumference of the circle is big enough, traffic can weave from one lane to another within one arc of the circle to facilitate exiting in the desired direction or at the desired point.

The system works best where there is a fairly good balance between the traffic flowing in one direction and that flowing in the direction at right angles. At one particular location in Edmonton, a large shopping center with parking space for 3000 cars stays open until nine o'clock on Thursday evenings. This shopping center is located adjacent to one corner of a rotary, and the pile up of cars when the stores close is serious. The city traffic Engineer, B. M. Huffman, feels that the same problem would exist with lights due to the heavy concentration of load from one direction, and argues that this problem is no fault of the rotary. Mr. Huffman likes the idea of the rotaries for vehicular traffic, but feels that the problem of handling pedestrians is complicated by the relatively large area involved and that motorists are encouraged to keep their cars rolling. The intersection laid out as a rotary handles just as many vehicles per hour as would the same intersection equipped with traffic actuated lights, without the expense of the lights and their operation. This of course assumes that the cost of land is not too high for the greater area involved.

From the engineering standpoint, no serious problems arise in the design or construction. The practice has been to chip seal the two inch AC surface for added traction. A rule of thumb that has been

evolved states that the radius of curvature into the rotary should be 100 feet, while that out of the rotary should be 150 feet. These radii are worked into the pork chop islands, and the engineers have found that for a ruling speed limit of 30 mph these figures seem to be the best from the driver's standpoint. Drainage is usually handled with extra large size catch basins located at suitable sag points governed by the grades. Curb and gutter are poured integrally. The roadway itself is a two inch AC surface on a gravel base, the depth of which is governed by the anticipated loads the particular streets are to carry. Contractors don't seem to mind the extra form setting, and no difficulty has been experienced in handling construction equipment around the site.

The major problem from the town planning point of view is keeping the land adjoining the rotary suitably zoned. The operating principle depends on the fact that the circle is to carry the vehicles on the approaching roads only. There was a trend towards service stations and small shopping centers on the odd shaped pieces of land left surrounding the circle. The problem of working suitable access routes for these small industries has yet to be solved. Just how serious this matter is remains to be seen but some trouble is anticipated, particularly from the safety angle.

As far as safety is concerned, the circles thus far have a good record. The odd motorist wanting to turn left has started around the circle the wrong way, and a few with possibly just the right blend of alcohol and gasoline could see no reason why they shouldn't go straight ahead. But on the whole, the traffic section of the police department are pleased with the way the drivers have taken to the system.

From an aesthetic point of view, the rotary gives the local parks board much more scope than a normal intersection. The large circular area in the middle lends itself readily to landscaping. It has been found that the dividing strips and islands are too small to do too much with, but the effect to the approaching motorist is definitely a pleasing one.

The maintenance crews have experienced little difficulty with this new type of intersection. The drainage area is considerable, but with the increased size of inlet on the catch basins, even heavy rains have had no serious effect. Snow in some cases gives rise to a more serious problem. Due to the open nature of the rotary, drifting quite often occurs. It has been a little worse at some locations than others but normal street cleaning operations take care of the extra load comfortably. The local snow falls average 52 inches over a ten year period from 1944 to 1954. Ice is a very serious problem, and sanding trucks are always dispatched to the rotaries as soon as icing conditions appear, and with extra attention from the maintenance trucks and a little extra caution on the part of the drivers, the condition is readily handled.

Since the cost of land varies so greatly between one area and another within the same city, perhaps the safest basis for comparison of these two intersections is the comparative cost of paving them. The City of Edmonton has found in doing the paving by contract that it costs an average of 37 percent more money to lay the paving for a rotary than it would for a standard intersection at the same point. This figure does not include the cost of the land.

● **ONE OF THE ROTARIES that help route traffic through the City of Edmonton, Alberta. Rotary radius is 150 feet.**

Where should you build a rotary? The answer seems to be an economic one. The economic problems involved will vary greatly from one community to another, but the experience of the City of Edmonton indicates that the traffic rotary, as a means of handling vehicles, definitely works.

• • •

Sidewalk Repair Procedures in San Francisco

A new ordinance in San Francisco provides that the Department of Public Works shall repair a defective sidewalk in cases where the owner, upon notification, has failed and neglected to do so. The cost of the repair is an obligation owed to the City by the owner of the adjacent property and secured by a lien on the lot in the event the amount due is not paid. Funds for this work are provided by the Delinquent Sidewalk Repair Revolving Fund to cover initially the cost of making the repairs and the fund is replenished by all moneys paid or collected from property owners for the sidewalk repairs made.

CEMENT STABILIZATION *with* TENNESSEE CHERTS and GRAVELS

E. A. WHITEHURST
Director, Tennessee Highway Research Program
The University of Tennessee
Knoxville, Tennessee

CHERTS AND GRAVELS, substandard in their natural condition, are available in large quantities throughout wide areas of Tennessee which are frequently deficient in other materials satisfactory for road building. Since the fall of 1951, the Tennessee Highway Research Program, a cooperative organization of the Tennessee Department of Highways and Public Works and the University of Tennessee, has been actively studying methods of stabilizing these cherts and gravels for use in road base construction.

During these investigations efforts were made to stabilize the cherts and gravels with portland cement; hydrated lime; a lime-flyash by-product of lime production; calcium acrylate; calcium chloride; emulsified asphalt; cutback asphalt (RC-2); and road tar (RT-5). Tests employed to evaluate the effectiveness of these treatments included (1) California Bearing Ratio; (2) wetting and drying; (3) freezing and thawing; (4) unconfined compression; and (5) triaxial compression. As a result of this comprehensive study it was concluded that the materials in question could best be stabilized through additions of portland cement, and that rather small quantities of cement would usually be adequate. For the better of the materials 4 percent cement, by weight, appeared to be quite satisfactory. It was recommended to the Tennessee Department of Highways and Public Works that experimental bases of this nature be constructed.

In September and October, 1955, the first road having a stabilized chert base built in accordance with the recommendation mentioned above was constructed. This road is located on a portion of Route Tenn-99 southwest of Columbia, Tennessee. The length of the project is 2.867 miles in Maury County and 3.875 miles in Lewis County, a total of 6.742 miles. The contract was performed by Bowyer and Johnson Construction Company of Jackson, Tennessee.

● **FINISHED ROADWAY, with surface treatment applied. This was the first road in Tenessee with a stabilized chert base.**

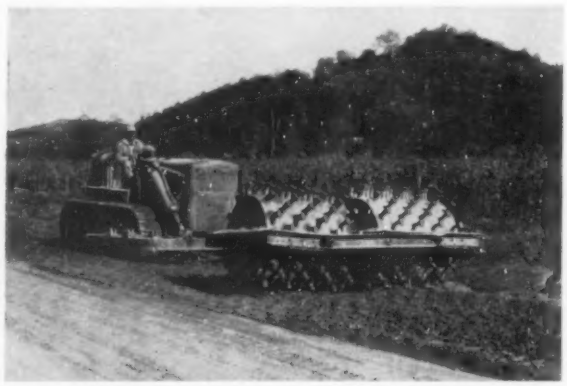
Material Characteristics. The physical properties of the chert,

TABLE I—Physical Properties of Soil No. 22

Liquid Limit (percent)	34.4
Plastic Limit (percent)	30.9
Plasticity Index (percent)	3.5
Shrinkage Limit (percent)	31.4
Specific Gravity, — No. 4 Fraction	2.64
Optimum Moisture Content, — 3/4" Fraction (percent)	26.0
Maximum Density — 3/4" Fraction (lb./cu. ft.)	92.6
Optimum Moisture Content, — No. 4 Fraction (percent)	27.5
Maximum Density, — No. 4 Fraction (lb./cu. ft.)	89.4
Absorption, + No. 4 Fraction (percent)	22.2

● **SPREADING** screened chert on the roadway. This native material was applied to a loose depth of 9½ to 10 inches.

● **MIXER** follows closely behind cement spreader and water truck so mixing will take place at optimum moisture content.



● **SHEEP'S FOOT** roller gives initial compaction to the freshly mixed material, usually making six to ten passes.

● **PNEUMATIC** roller ties down loose material. This was followed by a motor grader and finally by a tandem roller.

identified in the laboratory as Soil No. 22, are shown in Table I. It may be observed that the plasticity index is very low, but that the optimum moisture content and absorption are quite high. The maximum density is abnormally low for materials of this nature. The grain size distribution showed that very little material (about 5 percent) was present between the 40 and 200-mesh sieves and that 18 percent fell into the grain sizes usually associated with silts and clays. The very low P.I., however, suggests that these particles were very fine sand.

Construction. From the viewpoint of the use of local materials, this project was ideally situated. A local chert was used throughout the construction. This material was removed from a pit located immediately adjacent to the roadway and approximately midway of the length of the project. The maximum haul was approximately 3½ miles.

The work involved in construction of this road might be divided into four categories: (1) The spreading of chert for the shoulders; (2) the spreading of screened chert for the roadway; (3) the processing and compaction of the roadway; (4) the application of a double surface treatment to the roadway.

Chert for the shoulders was spread during all or part of 10 working days. The screened chert was applied to the roadway in approximately 29 working days. All processing and compaction required 11 working days.

The processing of the roadway chert was accomplished through the use of P & H 5-foot mixers. Two mixers were available on the job, although only one was used throughout a considerable period of the operation. The chert was spread to a loose depth of 9½ to 10 inches. Cement was next applied with a T. L. Smith Spreader at the rate of 73 pounds per lineal foot of roadway 24 feet wide. This rate of application had been selected prior to the beginning of the work as representing 4 percent by weight for a more or less normal chert material. Because of the extremely low unit weight of the chert, however, the actual cement content is somewhat in excess of 6 percent. The spreading operation appeared to be very well done and few adjustments of the spreader were required throughout the job.

The P & H mixer followed closely behind the cement spreader. The Division of Materials and Tests of the Tennessee Department of Highways and Public Works had determined that this chert had a very high optimum moisture content, in the order of 27 percent. The mixer, therefore, pushed ahead of it a water truck which supplied a suitable amount of water to the chert as the mixing took place. The mixers proved capable of picking up the entire 9½ to 10 inches of loose material, thoroughly mixing it with cement and water, and leaving it leveled off on the roadway as the mixer passed.

The mixer was followed closely by a sheep's foot roller. This was repeatedly passed over the freshly mixed material until the roller "walked out," which was usually accomplished in from six to ten passes. When the sheep's foot roller moved on to the next strip, it was followed by a pneumatic roller which

tied down the loose surface material.

After the pneumatic roller had completed its operation, the surface of the compacted base was clipped lightly with a motor grader and final compaction achieved by a number of passes with a tandem roller. This clipping and final rolling was frequently delayed until the morning following initial compaction of the base. As soon as the final compaction was completed, the surface was primed with an SS-1 emulsion, cut one to one with water, at the rate of 0.37 gallon per square yard. Immediately before the prime was applied the base presented a very good riding surface.

A noteworthy observation was the unusual performance of this material when wet. On at least one occasion a reasonably heavy rainfall occurred in the early afternoon. Cherts in this vicinity usually become very heavy and gummy when thoroughly wet, and frequently cannot be adequately compacted for a day or more until the material has partially dried. On this occasion no such phenomenon occurred; the sheep's foot roller continued to walk out of the mixed material in about the usual number of passes. The only concession made to the weather was that the water supplied by the mixer was turned off. Although the rain continued throughout much of the night and the unprocessed chert lying on the road bed was thoroughly soaked, operations were commenced at the usual time the following morning and no unusual difficulties were encountered. The only delay experienced was one of several hours before final clipping and rolling could be performed on the material compacted the previous afternoon.

Surface Treatment

Shortly after completion of the base, a double surface treatment was applied to the roadway. This treatment consisted of a first mat of size 15 slag applied at the rate of 40 pounds per square yard, and 200 to 250 penetration asphalt cement at the rate of 0.38 gallon per square yard. The seal consisted of size 19 slag applied at the rate of 26 pounds per square yard and the same asphalt cement at the rate of 0.30 gallon per square yard.

Quantities and Costs. Total costs involved in preparation and construction of the base aggregated $82,212.90, of which $28,594.38 was for chert for the surface; $19,499.26 was for the soil-cement processing (31,966 tons); and $28,393.57 was for 6,925 barrels of Portland Cement. Roadway, drainage and borrow excavations, water and bituminous prime accounted for the remainder. The construction of the surface cost $19,305.82 and included 69,357 gal. of bituminous material and 3124 tons of mineral aggregate.

The total paid to the contractor was $101,518.72. A 24-foot roadway 6.742 miles long involves a surface of 94,927.36 square yards. The total cost of this construction was, therefore, $1.07 per square yard, of which 87¢ represents the cost of the base and 20¢ the cost of the surface.

The cost of engineering supervision assigned to this project, and not included above was $10,353.83.

Summary. It is appreciated that sufficient time has not yet passed to permit a true evaluation of the performance of this pavement. It has been open to traffic since November, 1955, and its performance to date is satisfactory. The traffic volume is not large at the present time, but many of the loads are quite heavy as phosphate is now being trucked over this route.

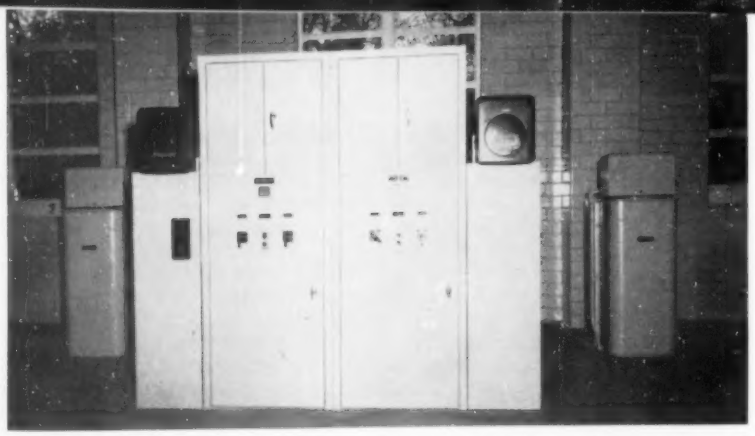
Subject to the continued satisfactory performance of this pavement, it is believed that many of Tennessee's sub-standard materials may be used successfully, economically and efficiently for road construction if they are stabilized with relatively low percentages of Portland cement.

AUTOMATICALLY CONTROLLED PUMPS IN BOOSTER STATIONS

A NEW PUMPING station with two automatically-controlled Fairbanks-Morse centrifugal pumps of 50 million gallons per day combined capacity is handling about 35 percent of the requirement of the Booster Pressure System of Omaha, Nebr. The Turner Boulevard Station was put into service in April, 1954, as part of a continuing program of expansion and improvement by the Metropolitan Utilities District, a program designed to keep abreast of the city's growing area, population and water requirements.

As recently as 15 years ago, the total annual supply pumped to the city was under 10 billion gallons. In 1954, the volume was a record 19,518,000,000 gal. and pumpage for

● **NEWEST STATION in the Omaha booster system. This houses a 3 mgd Fairbanks-Morse centrifugal pump which runs almost continuously at 95 percent rated capacity.**



● PUMP controls at one of the stations. Pressure switches regulate motor speed.

a single 24-hour period exceeded 100,000,000 gal. for the first time in the water department's long history. By the summer of 1955 the 24-hour pumping rate reached 120,000,000 gals. Progressive planning by the District engineers and administrators has insured provision of adequate facilities despite a marked acceleration in demand in the past five years. Not only has population risen but the per capita consumption of water rose from 137 gal. in 1953 to 165 gal. in 1954.

All of Omaha's water must be pumped twice and two-thirds of it a third time before it reaches the consumer. The first battery of pumps takes water out of the Missouri River for treatment at the Florence Station on the banks of the river about 6 miles north of the main business section. After treatment, additional pumps send the water to the city. The low-lying areas, such as downtown Omaha, are served directly, but this is a city of hills and, in 1954, it was necessary to re-pump 13,459,403,000 gal., more than 68 percent of the supply.

The Turner Boulevard Pumping Station was designed as the base load station in this booster system. This and the newer 3 mgd. Hartman Avenue Station are the only 24-hour stations serving the re-pump area and are the principal units in operation after midnight. During the day and evening, Turner Boulevard supplies the city's southern section which includes the important meat packing industry. There are five pumping stations serving the Booster Pressure System.

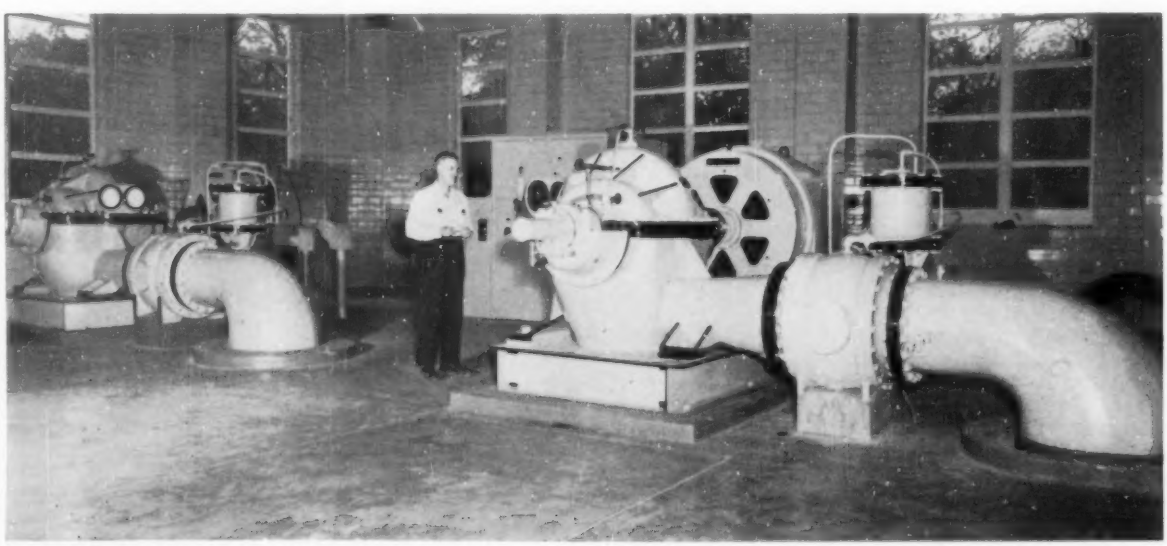
The Turner Boulevard Station, built at a cost of $395,000, takes suction from a new 48-in. main that runs directly from Florence to the new Field Club Reservoir, a 25 million-gallon totally-enclosed concrete reservoir that nestles under the 1st tee of the golf course. With valves controlled electrically from the booster station, it is possible for the Turner Boulevard pumps to draw water directly from the Florence main, from the reservoir, or from both simultaneously.

The two pumping units are identical double-suction, split-case, single-stage, 20-inch Fairbanks-Morse centrifugals, each rated at 17,400 gpm. (25 mgd.) at a total dynamic head of 138 ft. Each is driven by a 700-hp. variable-speed, slip ring F-M electric motor. In actual practice, the pumps operate with a positive suction pressure averaging 28 lbs. and discharge at about 80 lbs.

There are no storage reservoirs in the booster pressure distribution system and it is necessary to vary the pumping rate directly to meet fluctuations in consumer demand. This is accomplished automatically at Turner Boulevard by pressure-actuated motor controls. Pressure in the station discharge header regulates pump-motor speeds through 13 steps. Regulation of flow is so sensitive that station operators can tell from increased demand registered their flow meters when a popular TV program ends.

The pumps are started manually, after which speed regulation is wholly automatic. In starting the units, a hydraulically-operated ball valve in the discharge line remains closed until the pump builds up pressure, thus preventing surging in the system. In shutting a pump down, the operator actually shuts the ball valve which, when 80 percent closed, shuts off power to the pump motor.

The Metropolitan Utilities District is a quasi-municipal corporation operated under the direction of an elected Board of Directors with Ralph H. Trester as General Manager and Secretary to the Board. C. F. Holdrege is Chief Engineer and John C. Detweiler is General Superintendent of Water Operation.



● PUMPING equipment at the key Turner Boulevard station consists of two 25 mgd Fairbanks-Morse centrifugal pumps.

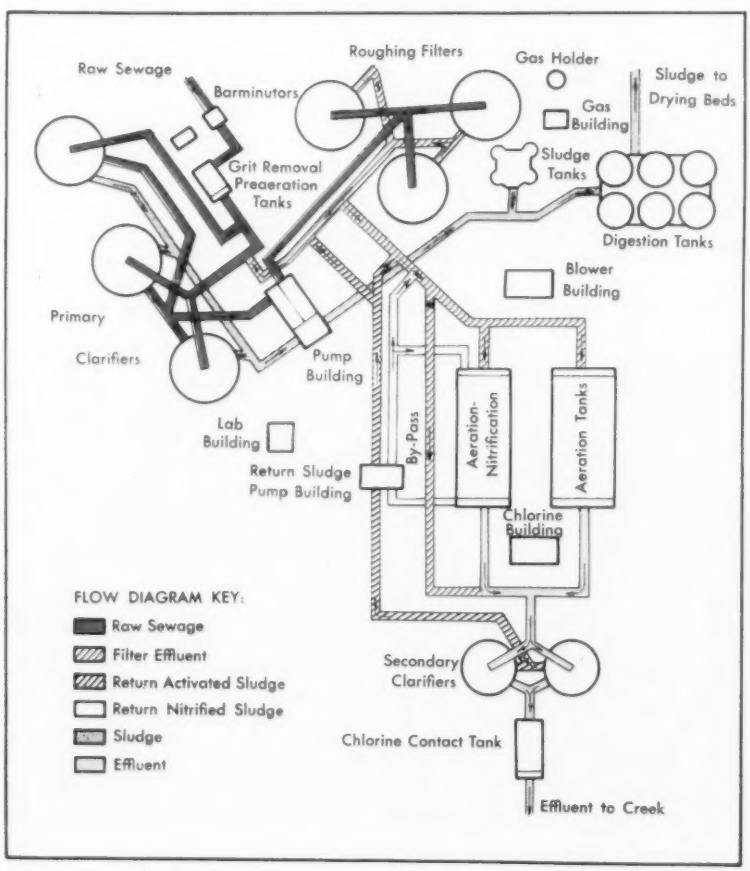
COMBINED DOMESTIC AND INDUSTRIAL WASTES *Treated by ENLARGED PLANT*

Charlotte, N.C., makes $2.5 million addition to Irwin Creek plant to cope with increased population and industrial wastes

W. M. FRANKLIN
Superintendent, Water Department,
Charlotte, North Carolina

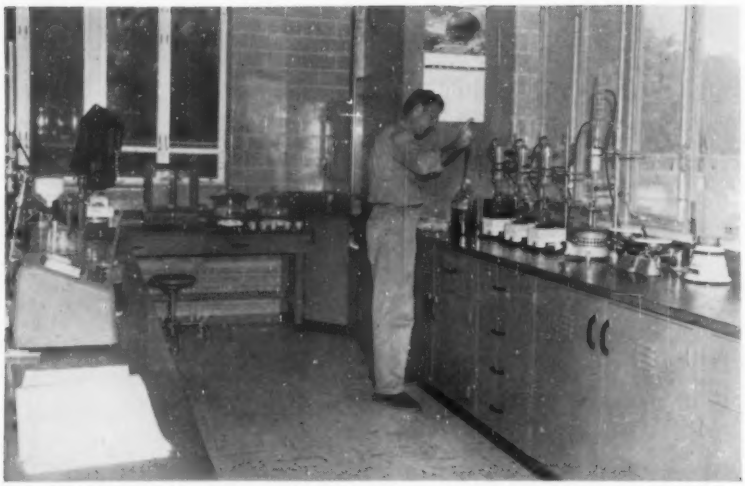
THE SECOND ADDITION to our Irwin Creek Sewage Treatment Plant was placed in full operation during August, 1956. An unusual feature of this installation is that it was designed to treat combined domestic and industrial waste under the terms of the City Ordinance regulating the use of the sanitary sewers. The total cost of this addition was approximately $2,500,000; some $500,000.00 of this amount was attributed solely to the treatment of industrial wastes discharged into the sanitary sewer system under controlled conditions, as stipulated by the Ordinance.

The original Irwin Creek Plant was placed in operation early in 1928. This unit, designed by Wm. M. Piatt, Consulting Engineers, Durham, N.C. (now operating under the name of Piatt and Davis), provided a treatment capacity of approximately 6 MGD of domestic sewage. At that time, industrial wastes were not allowed in the sanitary sewer system in the City. The old plant, consisting of hand raked bars for screening removal, aeration units, final settling units, raw sludge concentration tanks and vacuum filters for the dewatering of undigested sludge produced an excellent effluent until it became overloaded due to population growth and to the introduction of some industrial wastes without control into the sanitary sewers. The presence of these wastes severely hampered the proper operation of the activated sludge plant and made the problem of coagulating sludge for filtration very difficult.



Industrial plants, not utilizing the sanitary sewer system, were discharging their wastes into Irwin Creek, a small stream in the western part of the City. Constant complaints of odor emanating from the creek due to the presence of these wastes, led to a movement to clean up the stream in the same manner as Sugaw Creek had been cleaned. (The Sugaw Creek Combined Sewage and Industrial Waste Treatment Plant was described in the October, 1955, issue of PUBLIC WORKS). As a result of the movement to clean up all streams flowing through the City, the Ordinance mentioned above was adopted in 1950, providing for a cooperative effort in the removal of wastes from both Irwin and Sugaw Creeks, and establishing a control method for the treatment of such wastes in a combined domestic and industrial waste plant.

The design of the Irwin Creek plant was based upon plant operating data since 1928 and upon the



● **SEPARATE laboratory building is completely equipped to make analyses needed for plant control. Most industrial waste tests are made at the Sugaw Creek Plant.**

result of a very comprehensive stream pollution and waste survey made by Alvord, Burdick and Howson of Chicago. The J. N. Pease and Company, Architects and Engineers, Charlotte, were retained by the City to design and supervise the construction of the combined treatment plant.

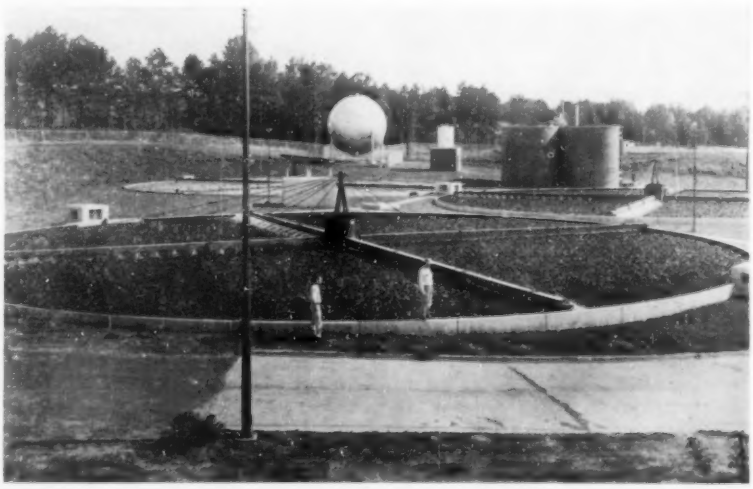
General Design

The capacity of the now completed combined plant is based on a 24-hour (average day) discharge of 10 MGD, a 24-hour maximum (average day) of 12.7 MGD, an 8-hour maximum (average day) of 13.3 MGD, a maximum 4-hour (average day) of 13.6 MGD, and a peak load of 20 MGD. The combined BOD loading used in the design was 500 parts per million or 41,650 lbs. per day. The plant design was also based on an equivalent population by 1964 of 245,000, assuming the BOD at 0.17 lb. per capita.

Preliminary treatment is provided by twin Barminutors for handling screenings followed by a grit removal unit utilizing diffused air. The influent is measured by a Parshall flume combined with indicating and recording instruments.

Primary treatment is provided by three new circular primary clarifiers utilizing Process Engineers equipment. Each of these circular units is 125 feet in diameter with a side water depth of 9 feet, providing an overflow rate of approximately 800 gallons per square foot per day. Two of these clarifiers will be used in the normal manner. Each unit has a capacity of 10 MGD influent plus 10 MGD recirculation, plus 0.1 MGD activated sludge, plus 0.1 MGD supernatant liquor return, or a total of 20.2 MGD, with a retention time of approximately two hours.

The third unit will be used as a supplemental primary clarifier, or as a storage unit utilizing its capacity to receive peak loading, either in flow or oxygen demand, for later discharge into following plant units. This novel scheme is one which the author has long desired to see incorporated into plant design. The design of this unit was based upon a very comprehensive study of plant loadings, both in volume and oxygen demand. It was found that the flow rates at the plant varied from an average of minus 53 percent to a plus 45 percent during a 24-hour period, while the oxygen demand varied from the average from minus 72 percent to plus 56 percent during a 24-hour period. It is anticipated that, with the utilization of the storage unit, the flow rates would be held from a minus 22 percent to a plus 15 percent from average and that oxygen demand rates would be held from a minus 36 percent to a plus 22 percent from the average during a 24-hour period. The contents of the storage tank over a definite period will be pumped through a small aeration unit with a 30-minute detention time. Air at the rate of 0.10 cu. ft. per gallon or more will be supplied in order to maintain anaerobic conditions in the clarifier. A pumping capacity of 2.5 MGD is installed for the purpose of handling the pumping problem. Two pumps are utilized in supplying this service, both with variable speed drive. Air will be provided by the standard aeration system.



● **HIGH RATE trickling filters, each 125 feet in diameter, provide intermediate treatment by leveling off peak BOD loads imposed on the plant by industrial wastes.**

Secondary Treatment

Intermediate treatment is provided by three high rate trickling filters. It is anticipated that these filters will serve to level off the peak BOD loadings imposed on the plant by industrial wastes. Each of these units is 125 ft. in diameter with a media depth of 4′ 2″ and a combined total area of approximately 37,000 square feet. There is sufficient capacity to allow for recirculation at a ratio of 1:1. Standard vertical type centrifugal pumps are used to pump influent to the primary clarifiers and for recircu-

lation to the filters. Raw sewage pumps are automatically controlled, utilizing floats in wet wells.

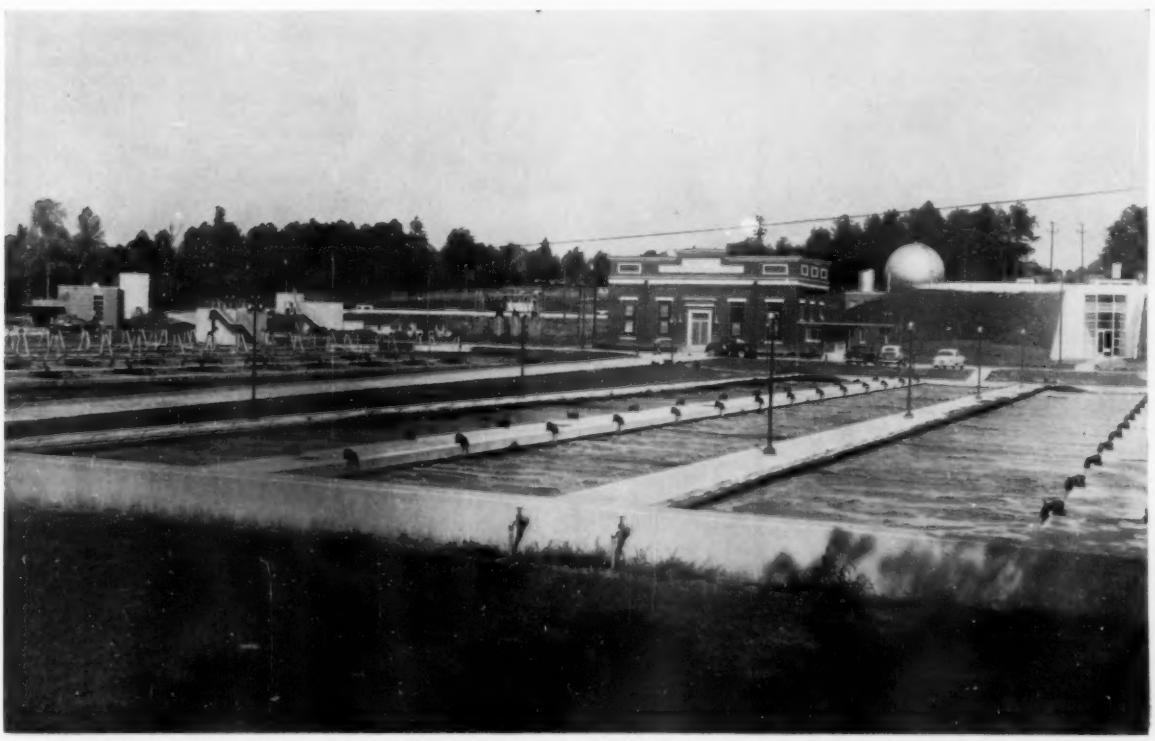
Four new aeration units, having a capacity of 356,000 cu. ft., have been provided for the production of activated sludge. The six original aeration units, with a capacity of 189,000 cu. ft., have been re-equipped with new aerators, and the original final settling tank areas have been converted to aeration units, providing a total volume of original units of about 249,000 cu. ft. A total aeration unit capacity of approximately 605,000 cu. ft. is now provided. Provisions have been made for the utilization of the Kraus Interchange Process in two of the available aeration units. Low pressure air for all purposes is supplied by five rotary positive type blowers manufactured by the Read Standard Corporation. Sufficient blower capacity of varying volumes, equipped with variable speed motors, is provided so that a total air handling capacity of approximately 20,500 cu. ft. per minute is available. Chicago Pump Company swing diffusers with Saran wrapped tubes deliver diffused air to the required points. This type of equipment was used in order to provide easy access to diffuser units for cleaning. The previously used ridge and furrow type diffuser units, while very efficient, were quite troublesome to clean in the case of clogging. Foam control has been established by means of the installation of spray nozzles throughout all aeration tank units. Effluent from the high-rate filters is pumped directly into a separate piping system for use in providing the necessary water for foam control. Diffuser tube washing equipment has been provided.

Secondary treatment is continued by two new circular final clarifiers equipped with Process Engineers equipment. These units are 100 feet in diameter, with a sidewater depth of 9 feet and a maximum overflow rate of approximately 855 gallons per square foot per day. The total surface area furnished is approximately 16,000 sq. ft., thus providing a detention time of about 2.5 hrs. at the average 24-hour day flow.

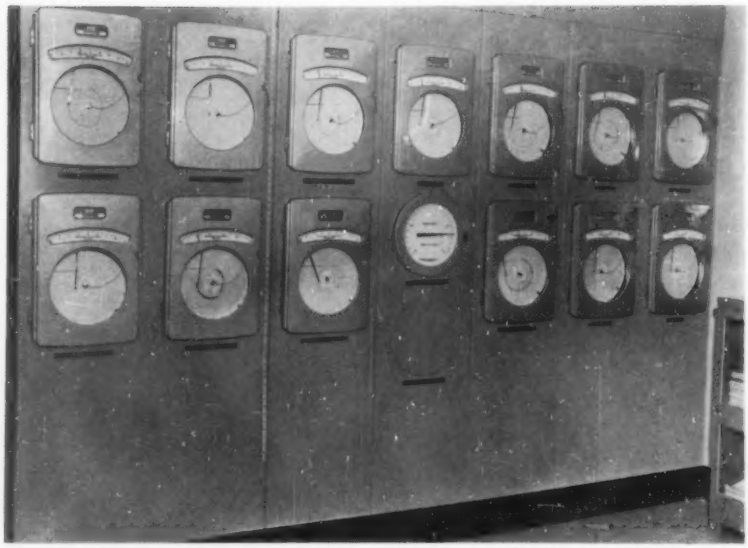
The effluent from the secondary or final clarifier is discharged through a chlorine contact chamber having a detention time of approximately 30 minutes at average daily flow rates and 15 minutes at peak loads. It is anticipated that chlorination of the final effluent will be necessary during the period when the receiving stream is low and the treatment works are operating at capacity. We expect to maintain a total plant efficiency of BOD and suspended solids removal of 90 percent.

Raw sludge is drawn intermittently from the primary clarifiers by gravity to sludge storage tanks where the sludge is treated as required with hydrated lime mixed by means of air diffusers and pumped by positive displacement pumps directly to raw sludge storage tanks, or to sludge digesters, as required. Activated sludge from the final clarifiers is pumped by vertical type centrifugal pumps to the head end of the aeration units, or to the primary clarifiers or a combination of both; or to the tanks equipped for utilizing the Kraus Interchange Process.

Sludge digestion capacity of approximately 460,000 cu. ft. is provided in six 65-ft. diameter digesters equipped with floating covers, each having a depth of 21′ 6″. Sludge is heated by two Pacific Flush Tank heat exchangers using digester gas as fuel. These heat exchangers are located in the sludge digester house. The gas taken from beneath the covers is compressed and stored in a Hortonsphere storage tank at about 29 lbs. per square inch pressure. Explosion proof switches and other similar equipment is provided throughout the system.



● **AERATION UNITS include those in foreground plus the old tanks at left, newly equipped with swing diffusers.**



● **INSTRUMENT panel board located at the main control panel provides records of sewage flows in each flume, volumes of activated sludge and the air-sewage ratio.**

A new and novel step in the handling of raw sludge has been built into this plant. In an effort to lower the volume of raw sludge pumped into digesters, raw sludge concentration tanks, utilizing the Laboon Process, are now in use. These units, four in number, are each 20 ft. in diameter, with a sludge storage depth of 24 ft. They are designed to provide a minimum of two days' sludge storage capacity. Odors will be controlled by utilizing a Catalytic unit. Preliminary tests indicate that sludge in concentrations between 10 and 14 percent may be expected with a two-day storage cycle. This sludge has been handled very successfully with a conventional plunger type pump.

Digested sludge is pumped from the digester to uncovered sludge drying beds by two plunger type sludge pumping units and one Screwpeller centrifugal type unit. Uncovered drying beds equipped with underdrainage systems, and having a total area of approximately 211,000 sq. ft. are provided. All drying beds are equipped with Link-Belt travelling conveyor belt units in order to facilitate sludge removal. Dried digested sludge is disposed of by the sale to landscapers and to citizens in bulk to be utilized as fertilizer.

A separate laboratory building, complete with equipment of modern design, has been provided for making analyses needed in controlling this combined plant. Industrial wastes may be handled in this laboratory; however, in general, it is anticipated that all industrial waste samples will be handled in the Sugaw Creek Laboratory.

The Irwin Creek Plant was designed and construction supervised by J. N. Pease and Company, Architects and Engineers, Charlotte, N.C., George S. Rawlins, Vice President and Chief Designing Engineer; Paul Seanor and Tom Tassos serving as Resident Engineers concurrently. The plant will be operated under the supervisory staff of the Water Department. R. S. Phillips, Assistant Superintendent in Charge of all Treatment Works, both water and sewage, and Chief Operator, E. L. Nance, assisted by a staff of six operators, one chemist and nine operator helpers will provide the close operation of this plant.

We wish to acknowledge the assistance rendered us in collecting this data by Tom Tassos, Resident Engineer for the J. N. Pease and Company.

CONTRACTORS AND EQUIPMENT MANUFACTURERS

Contractors

General Construction:
Rea Construction Co.

Installation of Air Diffusion Equipment in Original Units:
L. O. Chapman Company, Inc.

Low Pressure Air Compressors:
Chicago Pump Company, Inc.

Pumping Units and Controls:
Fairbanks, Morse & Co.; Worthington Corp.; Bell & Gossett, Inc.; and Purser & London, Inc.

Laboratory Furniture:
Charlotte Chemical Labs., Inc.

Electrical Work:
R. H. Bouligny, Inc.

Heating and Ventilating:
A. Z. Price and Assoc., Inc.

Plumbing Work:
Toomey Brothers

Air Diffusion Equipment:
Chicago Pump Company, Inc.

Equipment Manufacturers

Electrical Switchgear:
General Electric Company

Raw Sewage Pumps:
Fairbanks, Morse and Co.

Raw Sludge Pumps:
Marlow Pumps

Activated and Nitrified Sludge Pumps:
Fairbanks, Morse and Co.

Flushing Water and Spray Pumps:
Fairbanks, Morse and Co.

Miscellaneous Pumps:
Chicago Pump Company, Inc.

Flow Instrumentation:
Builders-Providence, Inc.

Digester Floating Cover, Gas System Balancing Tank, Sludge Concentration Tanks and Heat Exchanger:
Pacific Flush Tank Company

Gas Holder:
Chicago Bridge and Iron Co.

Air Diffusing and Tube Washing Equipment, Grit Removal System:
Chicago Pump Company

Primary and Secondary Clarifiers and Roughing Filter Equipment:
Process Engineers, Inc.

Barminutors:
Chicago Pump Company

Electrostatic Air Filters:
American Air Filter Co., Inc.

Gas, High Pressure Air and Instrument Air Compressors:
Worthington Corporation

Low Pressure Air Compressors:
Read Standard Corporation

Catalytic Units:
Catalytic Combustion Corp.

Chlorinator Equipment:
Wallace & Tiernan Inc.

Gas Metering Equipment:
Hagan Corporation

Cone Check Valves:
S. Morgan Smith Company

Sluice Gates:
Armco Drainage & Metal Products

Flash Mixer:
Walker Process Equipment, Inc.

Pump Priming Unit:
Skidmore Corporation

Sludge Conveyor Equipment:
Link-Belt Company

The NEWARK AIRPORT
A Study in
MANIFOLD MAINTENANCE

LEE K. JAFFE

Director of Public Relations

The Port of New York Authority

WHEN THE BIG mid-March snowstorm in 1956 hit the greater New York-New Jersey metropolitan area, it blanketed Newark Airport's 2,300 acres six inches deep on a Friday night; took a breather, and two days later swathed the airport in eighteen inches of soft, drifting snow. Throughout the weekend the Newark Airport Maintenance Department worked at the snow removal job in twelve-hour day and night shifts, using the Port Authority's twelve heavy pieces of snow fighting equipment.

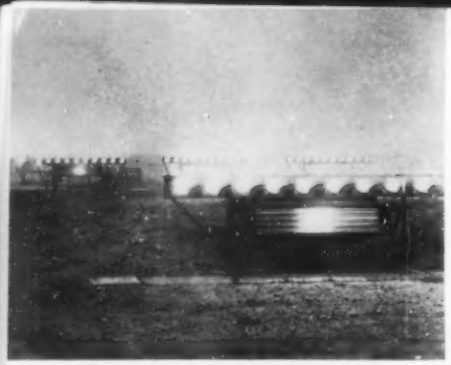
According to A. H. "Archie" Armstrong, Newark Airport's Manager: "Usually we can do the job with our own and contract equipment. But during the March storm we had to hire an additional bulldozer, a shovel loader and six dump trucks from a building contractor."

All Sunday night and Monday morning the men and machines labored in an unending race with the driving snow. One runway was plowed, blowing the snow up and over the landing lights, three times. Aprons and arcades were plowed in a circular manner, and the snow carted away in trucks. Clearing the employee and public parking lots was a big job in itself; but the airport never closed; passengers, cargo and mail were handled "as usual."

Snow clearance and removal is but one seasonal job in a maintenance program covering a vast area of buildings, runways, taxiways and aprons. One of the first municipal airports in the United States, Newark was created by the transformation of 68 acres of a 400-acre site of Port Newark marshland, early in 1928. In nine months, the tremendous engineering job of raising the level of the land by six feet, diverting four miles of creeks for surface drainage, and installing six miles of subsurface drain and sewer pipes was accomplished. Hydraulic fill was piped 13,000 feet from the ship channel and a million and a half cubic yards of dry fill was laid over the mud from the channel.

Officially opened for business in October, 1928, the infant airport had a single 1,600-foot-long, 200-foot-wide, cinder, asphalt-topped runway. This was the first hard-surfaced strip on any commercial airport in the country. The airport also had a 120-foot-square hangar.

As aircraft grew in size and weight, runways were lengthened and strengthened, and the boundaries of the airport were expanded. Postwar, the City of Newark recognized that the growing air industry would require vast additional construction. A planning and engineering study was conducted by consultants to the City of Newark. They recommended that Newark Airport and Port Newark be placed under Port Authority administration for financing, development and operation.



● **HIGH INTENSITY lights on runways must be given unfailing maintenance.**

As a result, in 1948, at the request of the City, the Port Authority and the City entered into a long-term lease covering both the airport and the seaport. Soon a major expansion and reconstruction program was started. The bi-state agency acquired 880 acres of land, increasing the airport's total area from 1,400 acres to 2,300 acres. A new instrument runway, equipped with the most modern electronic, radar and lighting equipment, was constructed at a cost of $9,000,000. And in 1953, the $8,500,000 Terminal Building, one of the largest and most modern in the United States, was opened. In addition, new hangars and a new cargo building will be added to the airport's facilities.

Since assuming responsibility of the airport, the Port Authority has spent or committed more than $27,500,000 in improvements. Today, Newark Airport is one of the most important air terminals in the nation, having handled 1,870,288 passengers, 8,510,600 pounds of mail, and 76,534,400 pounds of cargo in 1955.

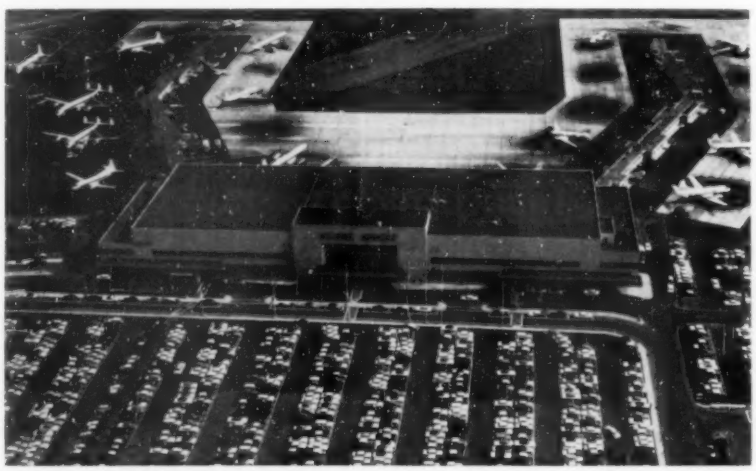
The Port Authority's responsibility underlies a huge program of organized preventive maintenance, inspection, and constant improvement. A team of 120 people make up the four-unit staff—maintenance, operations, police, and administration. About half this number do maintenance jobs which border on specialized engineering under the direct supervision of Roland Thompson, Maintenance Foreman.

"And not the least of the maintenance problems," says Mr. Thompson, "is the transportation of the maintenance men to the work sites over such a vast territory."

The Port Authority team is entirely responsible for the maintenance of the airport's grounds and runways, as well as the basic maintenance of roofs (leaks, skylights), steel supports and exterior walls of the tenanted structures on the airport. Such basic maintenance is usually stipulated in the lease arrangement with the tenant.

In the case of public buildings, such as the three-story Passenger Terminal Building, the Authority handles all maintenance, including plumbing, ventilation, heating, painting, electrical and metalwork, etc.

All major maintenance jobs at the airport are contracted for or are done by the Port Authority's Central Maintenance Department. Such jobs include major paving and large painting jobs. Cleaning in the terminal is done on contract. The Port Authority makes an annual physical inspection of the entire airport. A report is made on the condition of all areas, including all structures, and recommendations submitted for improving the facilities on hand.



● **TERMINAL BUILDING, loading aprons and parking spaces at the Newark Airport.**

Mechanical Maintenance

The specific maintenance areas at the airport include the following:

A. Steam boiler (heating) maintenance is performed on installations in the new and old terminals, the warehouse building, and several other buildings. The heating plant in the new terminal consists of three boilers. Two are in use, the third is reserved for the coldest weather conditions. Three heat exchangers supply several forms of heat throughout the building—hot water, hot air, and steam. The plant has an unusual location on the third (top) floor of the terminal. To install it below ground was prohibitive, economically, and ground floor space was at a premium. A designed "hole" in the roof serves as a hatchway for any necessary exchange of boilers. Here also are special pumping units for the oil-fired burners because low-cost No. 6 oil is used which further requires certain heating elements in the storage and delivery system. In addition, there are two circulating cold water pumps. Sump pumps are located in the basement which is below mean sea level.

A remote control panel for all heating, lighting in and around the new terminal building, floodlighting towers, pumps and fire sprinkler systems is also in the boiler room. A Port Authority watch engineer

(*Continued on page* 164)

● **SNOW REMOVAL operations are a big problem at an airport. Runways, aprons and parking areas, plus large vehicle parking areas, all need clearing.**

THE OVERHEAD SIGN

● **BRIDGE TYPE** overhead signs put the message in the clearest seeing zone of the motorist.

...ITS DEVELOPMENT AND FUTURE FOR TRAFFIC CONTROL

R. E. HOLADAY
Executive Assistant,
Ohio Department of Highways,
Bureau of Traffic

THE TREMENDOUSLY increased registration and use of the motor vehicle after World War II truly brought about a revolution in the design and operation of our streets and highways. Keeping pace with this revolution has been the commercial business establishments that serve the motor vehicle. The combination of these factors, that is, increased traffic volumes and speeds; complicated channelized intersections; interchanges and cloverleafs; multiple lane roadways of the new facilities; one-way street systems; and revision and modernizing older highways, together with the new, colorful, large and brilliant advertising signs adjacent to the old facilities, have literally forced the traffic sign over the roadway in order to display without interference, the necessary messages for the regulation and direction of traffic.

Facilities lacking positive sign messages produce driver indecisions, abrupt lane changes to correct to the proper lane at turnouts and at intersections, and just plain lost and confused motorists. All of these make for inefficient and unsafe operations, and generate a demand for the traffic sign to be placed within the clearest seeing zone of the eye. This is delineated by an optical angle of about 5 degrees. To locate a sign on the side of the street or highway within this zone is often impractical and sometimes impossible; and many times such a sign is invisible.

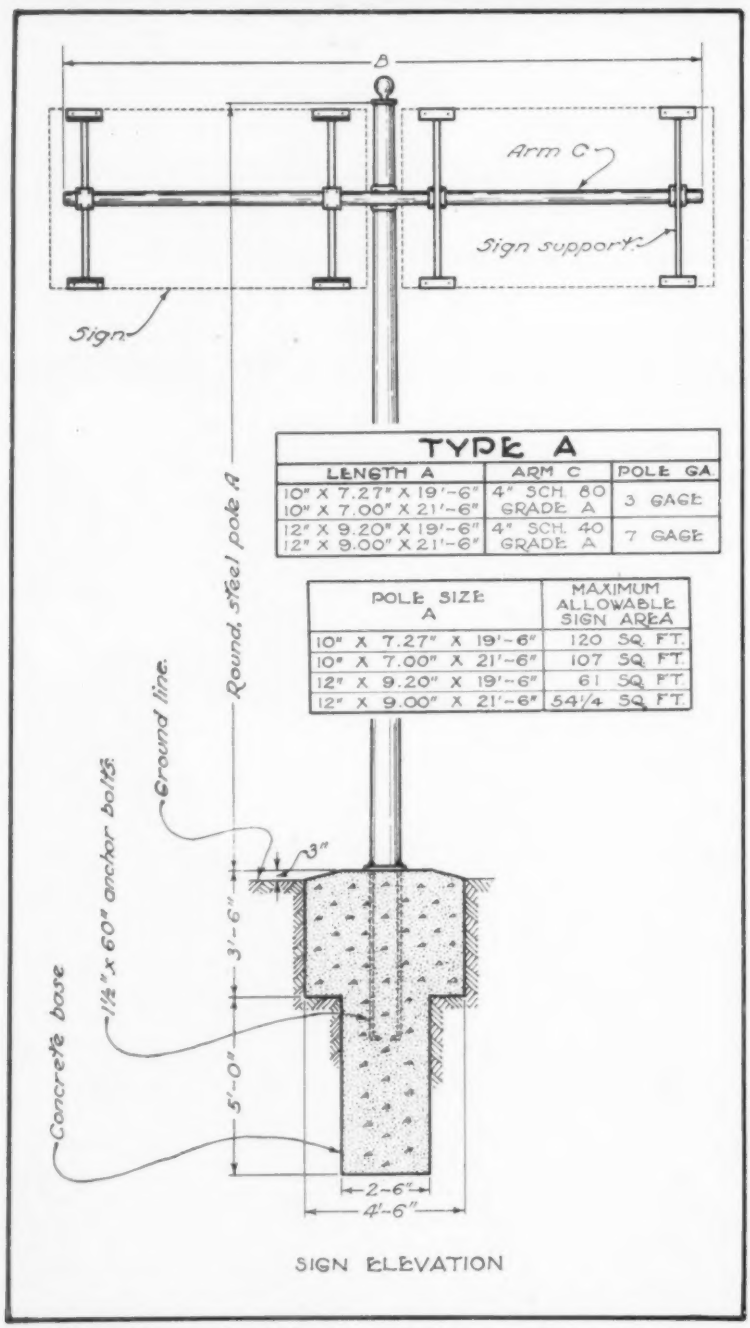
Early attempts to display signs on rural state highways over the roadways took several forms; but at each location so treated the driver reaction to and his compliance with the message was much improved; in many instances accidents were almost eliminated. The problem, however, was one of suitable materials and proper design to withstand the 70 to 100 mph windload that is encountered periodically in Ohio.

The first overhead sign installations followed the traditional mounting on a span wire attached to utility poles, or to similar poles erected specifically for such purpose. This method was simple and materials were available. However, making signs for the span-wire installation was another matter, inasmuch as the minimum size erected on rural state highways in Ohio for overhead applications was 5 x 3 feet, and often much larger. The task of fabricating the sign was of primary concern.

The first signs fabricated were built up from angle iron frames, to which were welded 16-gauge bonderized steel sheets. This method was not only expensive but the weight of the sign made it difficult to handle. Next used was an aluminum frame to which were riveted aluminum sheets. The fabrication cost of these signs was high; however, they did overcome the weight disadvantage of the steel sign assemblies. The next material to become available was high-density, plastic-surfaced plywood. The plywood sheets eliminated the framing costs of the steel and aluminum signs as long as the size of the sign remained relatively small. This material is still widely used when the size does not dictate elaborate framing to provide strength to meet the windload. In the meantime, however, the desirability of the overhead signs to direct and regulate traffic on the expressway, freeway, and limited access facility was becoming more and more evident.

At the same time the sign area for the proper size legend directing and regulating traffic was increasing to compensate for the increased speeds and more complex facility. The need was also increasingly apparent for lane direction, requiring a sign over each lane. The increased sign area for such installations imposed stresses on the messenger cable used in the span-wire mounts that caused the span occasionally to fail, due to fatigue from oscillating in the winds.

● **STOP SIGN means business! This 8 x 4 foot overhead sign was fabricated from extruded aluminum panels and surfaced with silver Scotch-Lite. The message background is transparent red. Flashing red beacons mount on sides.**



● **OHIO specifications for single pole overhead sign standard and bracket arms.**

The trend toward a rigid overhead structure to support such loads was evident as early as ten or fifteen years ago. Several states and a few toll road authorities had designed and fabricated such overhead sign structures; but it was not until the past five years that industry took sufficient interest to explore the market possibilities for such structures. Assured of a sufficient market, the Union Metal Manufacturing Company, Canton, Ohio, developed several simple structures from hot-rolled steel plate, fabricated into a tube and welded longitudinally. The tube was then placed on a mandrel and cold-rolled to form a taper and thus increase the tube's physical stamina. These structures are used largely in Ohio at this time.

One other fundamental development has taken place in the last two years to augment satisfactory basic materials for overhead sign installations. The aluminum industry has designed and produced a type of extruded aluminum sign panel. These aluminum sign panels are of high strength and stiffness and stand the stress of windloads with but few structural supporting members required. The panels are sufficiently light for ease of erection, and the surfaces will accommodate all reflectorized materials and surfaces commonly used today.

With no special designing and without a search for suitable materials, the overhead sign can now become part of the plan for each new facility where the need for such sign structures is indicated.

The designers were, however, faced with a problem heretofore not generally encountered: That of locating the overhead structures for signs on the plans before the facility was open to traffic. The overhead sign had to be placed in relation to the action to be taken. If the sign were located too far from the action, it lost identity with the location; if too close, sufficient maneuvering time was not provided. The erection details and placement of such signs required the consideration of the following factors: 1) Design speed of the facility; 2) number of lanes; 3) traffic densities; 4) complexity of maneuver; 5)

perception and reaction time of the driver; 6) deceleration and maneuvering time necessary; 7) vehicle speeds on the facility; 8) distance from car to point of maneuver; 9) length of message; and 10) legibility distance of the overhead sign After the values were assigned to the foregoing factors, it was then relatively easy for the traffic and designing engineer to determine the size of legends on the overhead signs, evaluate the legibility distances, and thus locate the structures in relation to the final action of the driver.

It is believed that the technique and development of the overhead placement for traffic control is just in its beginning, and within the next decade, many through streets and highways will be controlled and regulated from an overhead over-lane position.

● **REFLECTORIZED "Large Arrow" sign made on high-density plywood, with both flashers and direct illumination.**

● **CUT-OUT reflectorized letters, mounted on a span wire structure, used for signs where winds are frequently heavy.**

FINE GRADING THE BASE FOR STREET PAVEMENTS

A FAST, ECONOMICAL method of fine-grading sub-base for concrete streets has been developed by the Sheboygan, Wis. Department of Public Works.

The equipment consists of a "home-made" steel grading blade attached by "I" beam push arms to a Model "200" TerraTrac crawler tractor with ½ cu. yd. front end loader. Chains are attached to the push arms and hooked on the loader. Lift arms permit raising and lowering the blade as needed. The city has two of these blades, each just long enough to fit between paving forms. One is 9 ft. long for 30 ft. streets; the other 11 ft., for 36 ft. streets. Both are 7-inches deep so that, guided by rollers that ride on top of the forms (or curbing), they cut sand or gravel fill to exact depth of pour.

Excess fill that piles up in front of the blade is shoveled into the TerraTrac bucket for disposal at the end of the pass. This method saves both time and money; keeps grading well ahead of paving crews. An entire block of new street can be finish-graded in about two hours, whereas it used to take 4 men a full day to do the same job by hand.

The special grading blade can be detached in minutes, so the front-end loader can be used for excavating, loading trucks, spreading fill, etc. The tractor is also equipped with a rear-mounted hydraulic scarifier for ripping hard or frozen ground and old blacktop.

● **SPECIAL blade mounted on TerraTrac crawler fine-grades fill prior to paving.**

THREE-PRONGED APPROACH

DANIEL A. LINN
formerly Administrative Assistant to the City Manager Iowa City, Iowa

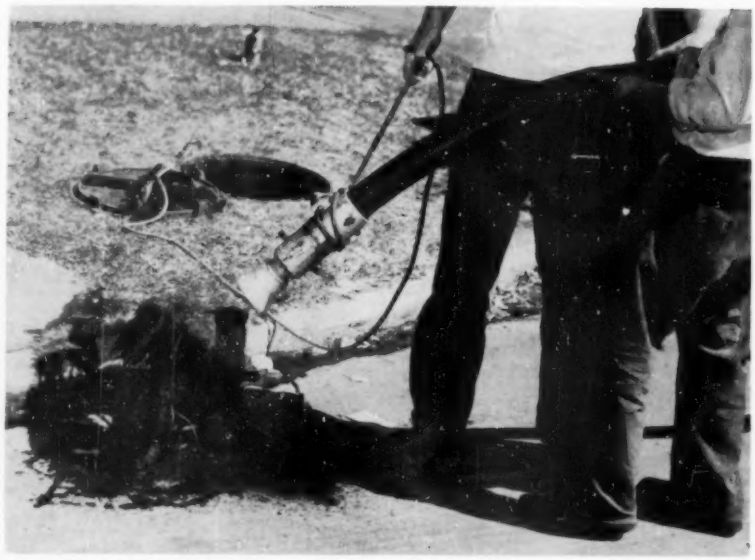
WITH THE LARGEST home construction year in its history, Iowa City, Iowa, (population 27,212) like many cities its size, was faced with the problem of providing adequate sewer service to rapidly expanding subdivisions. This rapid expansion has placed a strain on the existing sewer mains which are fast approaching their design capacity. Indications are that 1957 will see even greater construction and corresponding problems.

To meet this problem and provide a high level of sewer service, Iowa City developed a three-pronged approach: Mechanization and controlled programming of sewer maintenance; strategic extension of service; and public relations.

Mechanization and controlled programming of sewer maintenance were necessary. Manual cleaning of our 66 miles of sanitary sewer mains could not keep pace with the increasing demands on the system. Some of the sewers had not been cleaned in seventy-five years and could not be cleaned by hand operators or by light machinery. A section of sewer line previously abandoned because it could not be cleaned with the available City equipment was used as a testing ground for new equipment demonstrations. After extensive demonstrations and tests the City selected the "SeweRoder" Model TDP 584 manufactured by the Flexible Sewertool Corporation. The tests with the "SeweRoder" were so successful that the abandoned section of sewer was returned to operation in the storm sewer system.

The age and maintenance problems of the entire sanitary sewer system were studied from available records, including complaints of stoppages, construction data and such maintenance logs as could be located. The 66 miles of sanitary sewer were then divided into 11 sewer districts based upon trouble spots and age of sewer mains.

Maintenance of each district was scheduled according to the relative condition of sewers in the districts. The most difficult area was scheduled first in the comprehensive program. In this particularly difficult area as much as 200 pounds of roots were removed in a day.



● **AN ABANDONED 8-inch sewer was used as a testing ground for demonstrations of new sewer cleaning equipment. Shown above are some of the roots removed after one pass, using a three-inch auger powered by a Flexible "SeweRodeR".**

Sewer Cleaning

Up to the present, the three-man sewer maintenance crew has been cleaning 425 feet of sewer per day. At this rate of progress it will take slightly under six months to clean the sewers in each district. Thus, the entire sewer system of eleven districts can be cleaned every five and one-half years, including allowances for emergencies. Our mechanization of sewer maintenance has combined increased work rate with effective cleaning.

The key to the control of the program is a rather simple report form. This sewer maintenance log is filled out daily by the crew foreman. Information required includes: Weather conditions; location of work; amount of work done; type and quantity of material removed; and condition of sewer. The reverse side of the form contains a diagram and check list for maintenance services to be performed on the sewer cleaning equipment.

Data recorded on these forms can be utilized to revise work schedules in accordance with weather conditions and to indicate causes and locations of possible sewer disruptions. The controlled programming has resulted in systematic sewer maintenance control through operational reports which provide a basis

● **MECHANIZATION of Iowa City's sewer cleaning operations has made it possible to develop a controlled maintenance schedule. Work progress is carefully recorded.**

SOLVES SEWER PROBLEMS

for future planning and assure design capacity.

The second aspect of Iowa City's approach to the sewer problem is strategic expansion of the system. Subdivision development is obviously proceeding in an easterly direction, covering two drainage areas. One drainage area is within the present City limits and its system is among those approaching capacity. The other drainage area, approximately 490 acres, is almost entirely undeveloped and largely outside the corporate limits.

To make provision for this development, a sewer project was undertaken in the second drainage area. This project was multifunctional, having three purposes: To provide sewer service for those sections of the City not presently serviced; to provide service for those areas not yet in the City that will be subdivided in the next few years; and to provide overflow service to the adjacent drainage district now approaching capacity. This project, when completed during 1956, will include a pump station, 8300 feet of sewer line and 2200 feet of force main. The cost of $120,097 will be paid by the developers in the drainage area as they build their subdivisions. Thus, by strategic expansion, the existing system will be relieved and future development will be fostered.

The third, and perhaps most important, approach to the problem is public relations. The objectives of this approach are to inform the public of the action initiated by the City to cope with the sewer problem, and to explain the benefits to be derived from the use of the efficient, but relatively expensive, sewer cleaning equipment.

When the sewer program was inaugurated, the local newspaper cooperated with the City by publishing pictures of the sewer equipment in action, accompanied by a story explaining the City's new program. To follow up this initial information, the City prepared illustrated leaflets explaining the necessity and benefits of using mechanical sewer maintenance equipment.

As the leaflets are intended to be distributed to homes in the area where the equipment is operating, their distribution has been integrated into the work procedure of the sewer maintenance crew which can distribute the leaflets while the equipment is operating. Thus, there is little or no lost time and the effect of timeliness is achieved by calling the citizens' attention to the sewer program while the equipment can be seen operating in their neighborhood. The leaflets also extend an invitation to inspect the machinery in operation and query the operators about the sewer maintenance program.

As a final step, the operators were fully informed about the sewer program and instructed in the art of courteous response.

● **EXPANSION of the system is needed as subdivisions grow. This link consists of 525 feet of 12-inch extra strength pipe. At the point shown pipe is 18 feet deep.**

Iowa City's three-pronged approach to the sewer problem is achieving results. Through mechanization and controlled programming of sewer maintenance, the City has not only improved the efficiency of the present sewer service, but even expanded the service by reinstating formerly abandoned sections of sewer main; through strategic expansion existing service has been relieved and development fostered; and through public relations, a constructive interest in the sewer maintenance program has been fostered among the citizens.

● **ANOTHER VIEW of roots removed from the 8-inch abandoned sewer. Cleaning test was so successful that the main was returned to service in the sewer system.**

SALT STABILIZATION ON 260 MILES OF SECONDARY PAVEMENT

Low cost rehabilitation method for old pavements uses construction sequence that keeps road open to traffic

● **OLD SURFACE** is scarified, sometimes more than once, to obtain needed amount of soil for the new surface mixture.

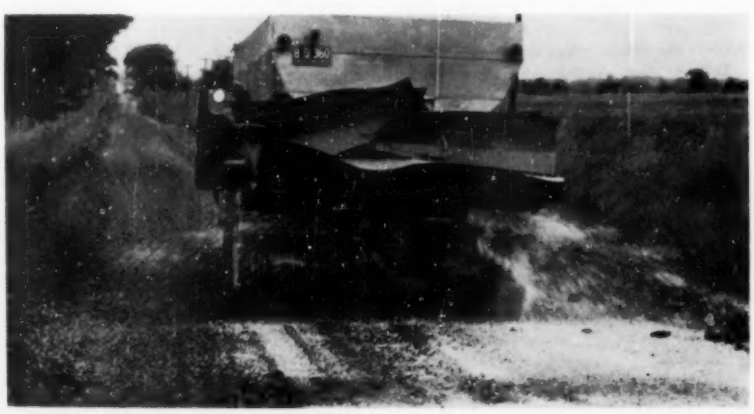
● **SCARIFIED** material from the old surface mat is broken down with a pulverizing machine; then windrowed to the side.

J. W. REPPEL

Engineer of Maintenance

Ohio Department of Highways

SOME 25 MILES of salt stabilized pavements were built by State forces on four projects on our secondary system during 1955. Results proved so satisfactory that it was decided early in 1956 to set up a sizeable program of similar work to be done by the contract method. The controlling objective in this type of improvement is the reduction of maintenance costs on the mileage



● **SALT** was applied at the rate of one-half pound per square yard per inch of thickness of base material, then sandwiched under remainder of windrowed material.

of secondary low traffic roads on the State System that, from the beginning, have been developed by trafficbound methods, at considerable annual cost to the State and with varying degrees of service to the traveling public.

Based on previous experience, a minimum yet adequate specification was prepared to accomplish desired results. The overall operation required scarification of existing surface to a minimum depth of 4 ins., pulverizing, adding additional aggregate and rock salt, mixing, adding water as necessary, spreading and compacting in uniform layers to a properly crowned smooth surface, and applying a bituminous prime coat. The rock salt was furnished by the State, and contracts were advertised with unit bids on various work items.

Each project was sold separately, and was built without closing the road to traffic. The average net length of a project was about five miles. In a number of locations, certain intermediate areas of existing pavement were specifically excluded from the contract, because they were considered to be satisfactory and not in need of stabilization. Bidding was very keen. Bid prices averaged slightly over $3,500 per mile, including the prime. Some contractors bid successfully on more than one project. And since it was felt in advance of the bidding that many of the bidders also would be interested in our normal seasonal bituminous contracting work, it was decided to start early in the season and to require an early completion date on these contracts. As a result, practically all of the 260 miles of salt stabilization projects were completed satisfactorily before the end of June.

Preparing the Old Road

The contractor's first job was to scarify the old road. Some of these surfaces had some type of bituminous cover of varying thickness; and since the existing road was also of varying thickness and contained different percentages of aggregate and soil admixture, it was sometimes necessary to scarify all or parts of the surface more than once, in order to secure the necessary minimum of soil to be incorporated into the road surface mixture. The required scarifying (minimum 4-in.) was not generally satisfied until approximately six inches of the old road had been opened.

Some of the contractors experienced difficulty in breaking down properly the scarified material; but with suitable pulverizers, their difficulties were readily overcome. Frequently it was necessary to make several complete passes with the pulverizer, before all of the scarified surface mat was properly crushed. Preparatory to pulverizing, the material was placed in two or three windrows, depending on the specified pavement width.

The conditioning and spreading of the scarified material having been completed and the mixture windrowed to the sides, application of the required amount of aggregate was made as directed by the

● **SPREADING windrowed material to "sandwich" the salt on one side of the road. Opposite side remains open to traffic.**

● **BASE COURSE is sprinkled conservatively and shaped with a motor grader. Opposite side of the road has been finished.**

● **INITIAL rolling of the top course after all windrowed material was spread. All rollers used weighed about ten tons.**

● **PRIME coat was applied after the road had dried for a minimum of seven days. Opposite side is primed and covered.**

engineer (usually one-half width at a time). Variation of the unit spread was made necessary because of the natural variation in fines in the scarified material, an area having an excess in fines requiring more aggregate. A general average of 500 to 750 tons per mile of 18-ft. pavement, or approximately 100 to 150 pounds per square yard, was specified. Necessary adjustments in actual spread per square yard were readily made. Limestone, gravel, and slag were used. Ohio Specification size No. 46, or crusher or bank run aggregate, all of which required a top size of 1-in. and a limitation on fines, were used.

Salt Spreading

After completion of the spreading of the aggregate, approximately one-half of the windrowed materials were cast over the aggregate by the use of a grader and the application of rock salt was made. The salt was spread at the rate of one-half pound per square yard per inch of thickness of conditioned material and aggregate. Immediately after the salt was spread, the other half of the windrowed material was cast over the salt, thus "sandwiching" the salt and making certain that a very good general distribution of the salt would result in mixing.

Prior to this mixing operation, the sprinkler was put to work and an attempt made to add the required volume of water. This was found to be quite difficult, because of the existing and quite variable amount of moisture contained in the materials before mixing. The sprinkling requirement is naturally often a matter of estimating, because rainfall is generally prevalent in Ohio during the spring months. If the consistency of the resultant mixture appears to indicate too little moisture, more sprinkling must be done; on the contrary, if too much moisture is indicated, the mixture must either be reworked or be spread and given time to dry out sufficiently before finishing. Generally the use of the sprinkler should be somewhat conservative for individual applications of water, so as to avoid the necessity for additional mixing or for a drying out period. An occasional additional sprinkling was often found to be both advantageous and cheaper.

Immediately after the initial sprinkling is well along on the full width of a definite length of road, the mixing of the entire loose material is started and carried on to completion. This length varied considerably, depending on various factors, such as intermediate sections, cross roads, etc. It was seldom less than 1,000 ft. or more than one-half mile. The most satisfactory mix was obtained through use of the patrol grader, with materials handled a minimum of three turns on the mold board.

After the completion of this initial mix to the satisfaction of the engineer, and if the moisture consistency appeared to be satisfactory, windrowing was next done. If the consistency appeared off, procedure as indicated in the last preceding paragraph was followed.

Windrowing and Rolling

Although the specifications indicate a preference for windrowing to each side, a very practical and generally satisfactory procedure followed was that of windrowing all material in one ridge slightly off center. Then the wider side received the first spread from the windrow, traffic using the narrower side opposite. If advance sprinkling of the roadway on the wider side was considered in order, sprinkling was done. Then a portion of the windrow was spread over the wider side. This portion of the windrow was gaged at approximately one half of 60 percent of the total windrow, the other half to go later on the opposite side; and when both sides were finished, the remaining 40 percent of the windrow is used in the second or top course of the pavement. For a pavement that will have a finished thickness of 4 ins., this procedure will provide a base course thickness of about 2½ ins. and a top course thickness of 1½ ins.

Immediately after the windrowing on the wider side had been completed, it was sprinkled and rolled until a salt brine began to appear on the surface. Rolling was best accomplished by the use of the pneumatic tired roller, although it was often accompanied by tandem and three-wheeled rollers. All rollers weighed approximately ten tons. The grader thereupon made a smoothing-up pass over the rolled side and proceeded to spread on the opposite side its share of the base course windrow; then the grader shoved the remaining top course windrow material slightly to one side, so as to clear the full half-width base course material on this second side, which then received the same attention given the first half width of the base course. This type of operation served to discommode traffic very little, and in no way affected the satisfactory completion of the full width of the base course.

After the completion of sprinkling, rolling, and smoothing of the base course, the windrow material remaining for the top course was spread to the required crown of ½ inch per foot over the entire specified pavement width by the grader making a full pass down the middle and back on each side, distributing this material full width. Sprinkling as required and finish rolling with a flat wheeled 10-ton roller were thereupon carried on as before, until a light brine appeared, and the finished surface was touched lightly by the grader.

Curing and Priming

The road was then permitted to dry out for a minimum period of 7 days. During this time, the grader was used very lightly, principally to maintain a very light and well distributed amount of float on the surface, in the interest of safety, since in the initial stages of the development of this type of pavement even a slight rain will tend to make the surface slippery. If no rain falls before priming, it may be desirable to sprinkle lightly to prevent raveling of the top.

When about to start the prime, the grader was used lightly to redress the surface uniformly. For priming, light tars, medium curing asphalts, and immiscible type emulsions were used. The quantity is generally about 0.33 gallon per square yard, one application, with about ten pounds of Ohio No. 6 (½-in. down) aggregate cover and rolled. The seals are being sold as separate contracts to be applied as soon as possible to prevent any raveling of the primed surface.

The 260-mile salt stabilization program was planned and authorized by C. W. McCaughey, Deputy Director, Division of Operations, under S. O. Linzell, Director of Highways. The Bureau of Maintenance, which functions under the Division of Operations, administered the contracts through its field engineers, with work performed under the direct supervision of the various highway division engineers.

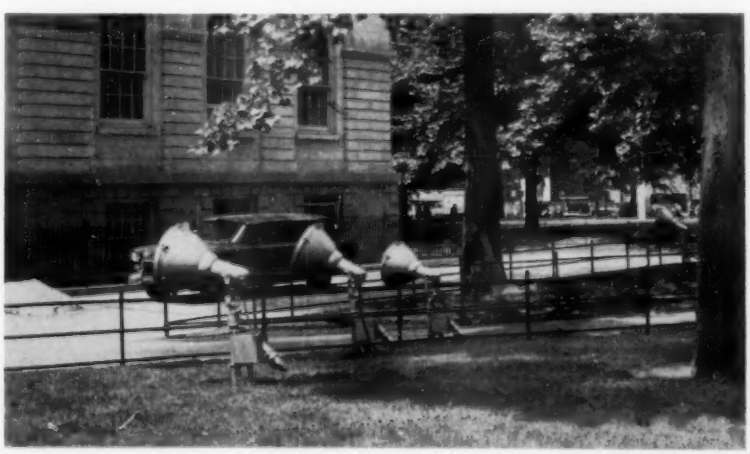
NEW YORK'S CITY HALL
Sparkles DAY and NIGHT

● **NEWLY CLAD in a casing of Alabama veined limestone, the historic City Hall Building presents a picture of which New Yorkers are justly proud. Both the exterior and interior of this noted landmark were refurbished in a project that required two years of work and cost two million dollars.**

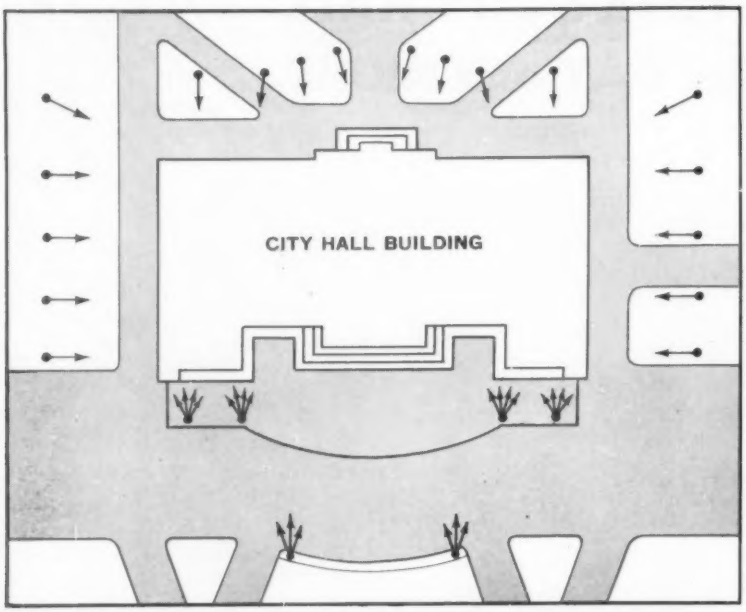
IN A PROJECT that took two years and cost $2,000,000, the exterior of New York City's historic City Hall building has been restored to its original beauty by replacement of the discolored outer stone and sculptural details with new, durable material. During the process the interior was refurbished, and fifty-two new floodlights were mounted to illuminate the exterior at night.

Renewing the exterior of the structure was a complicated procedure. Age and the elements had brought about deterioration of the facades and columns, while soot had discolored the surface. Many structural items including wooden lintels, timber plates and brick arches needed replacement. As constructed between 1803 and 1812, the south (front), east and west sides were built of Massachusetts marble above the first floor level. Brownstone was used for lower areas and for the entire north side. The outer stone casing varied in thickness from five to eighteen inches, and because of the nature of the wall construction, this casing could not be removed entirely. Instead, a four-inch thick slice was shaved off, and this was replaced with durable new stone which is similar in coloring to the original. Unpolished Missouri red granite was used for the basement level, and Alabama veined limestone replaced the marble and brownstone on all sides above the first floor.

Original architectural and sculptural features were reproduced faithfully after careful study of original plans and drawings at the New York Historical Society,



● **THREE of the 40 new floodlights installed around the newly rehabilitated New York City Hall. These ground-level lights are located at the rear of the building.**



● **LOCATION of the 40 new Crouse-Hinds floodlighting units that illuminate the City Hall Building. Each arrow represents a light and shows direction it is aimed.**

● **PUBLIC WORKS department crew gives final adjustments to a battery of floodlights mounted on an ornamental light standard in front of the City Hall Building.**

measurements and drawings prepared in WPA days, and supplementary checks on all details made by the architects. Skilled stone cutters reproduced original stone carvings by the hundreds. For the new veneer, over 15,000 individual stones were used, each fastened to the original wall with a minimum of two bronze anchors.

New Floodlights Added

Though the original beauty of the structure was preserved in every detail, one feature was added which was never contemplated by its builders in the early 1800's. This is the installation of floodlights, which make a nightly display of what has often been termed one of America's finest public buildings.

A total of 40 Crouse-Hinds floodlighting units were used to illuminate the exterior from each of the four sides; 1000-watt lamps were selected for most of the units, with 500- and 200-watt lamps being used in a few places to produce the best uniformity of illumination of the facades of the building. Lighting for the cupola had previously been installed on the roof. Special brackets on ornamental lamp posts in front of the building provide space for floodlights at mounting heights of 12 and 27 feet. Other floodlights are mounted at ground level. These are partially concealed by judicious landscaping with shrubs and evergreens. A permanent installation of underground power cables serves the ground-mounted units.

Light-meter readings taken at various windows show that the front of the building has an illumination ranging from 10 to 15 foot-candles, while the other three sides have approximately seven foot-candles. The uniformity of the light distribution may be seen from the photograph taken after dark.

Electric astronomical time clocks are used to switch on the floodlights each evening, the time to coincide with twilight shadows, and to switch them off automatically a few hours later.

A rededication ceremony for the rehabilitated City Hall building was held on July 12, 1956, culminating thirteen months of construction work. Design and restoration were directed and supervised by the New York City Department of Public Works, Frederick H. Zurmuhlen, Commissioner. The architects for the project were Shreve, Lamb & Harmon, and the general contractors were Republic Stone Corporation and United Stone Works, Inc.

A SHADE TREE COMMISSION PAYS ITS WAY

EARL REEVES

ONE OF THE FIRST communities in the country to make a Shade Tree Commission a department of municipal government, was Ridgewood, N. J. That was in 1911.

This decision was sounder than was then realized because, during the years since, newcomers to this suburban village have been chiefly reformed New York cliff-dwellers seeking better living and having a yen for trees, shrubbery and green grass. They were tree-conscious, so was this town; and that made it popular and helped growth and property values.

The population now is 25,000. There are also 25,000 shade trees along 80 miles of streets in its 6.2 square mile area, plus another 1,000 in parks. It has been officially estimated that these trees have an average value of $125 each and a total value of $3,250,000. This appears to be on the conservative side; their worth to home-owners is several times that sum.

In 1916, a man named Henry Leuning started to work for the Shade Tree Commission. Nine years later, or 31 years ago, he became superintendent. He now heads a crew of ten. The purpose herein, with Leuning's help, is to have a look at the Commission's work to see what 45 years of experience may have yielded in operating experience which can be useful to other communities.

The Leaf Harvest

During many years Ridgewood followed existing standard practice in the annual job of collecting and disposing of leaves. The fall clean-up was a big operation and a sizable debit in the Village ledger. The leaves were hauled away to be dumped in low, swampy ground. Today it is recognized that this was mighty rich fill—and sheer waste.

For a dozen years the fall clean-up has not rated as a necessary nuisance. Instead, this is a harvest time. Leaves have become a cash crop with a high dollar value. They are a credit in the ledger now, cash in the bank; and the size of the annual deposit is quite surprising.

This "crop" is stockpiled in the Commission's nursery area. Here each year, three piles of leaves are built up measuring about 50 by 50 feet and 10 feet in height; total volume is about 2,800 cubic yards. Each pile receives a chemical treatment consisting of 150 pounds of ammonium sulphate and 200 pounds of phosphorus at a total cost of less than $50. After one year the leaves are run through a grinding machine and are tested to determine whether more fertilizer chemicals should be added, and how much.

Weather, chemical action and busy bacteria speed up decomposition in the piles of ground mulch as they shrink in volume by one-half or more. By the end of the second year the processing of this crop has been completed and the result is about 1,200 cubic yards of leaf mold, a highest quality plant food. This mold contains the major fertilizer chemicals which have been added during the processing period and small amounts of several useful minerals which trees extract from the soil.

Another contribution to the annually renewed "soil bank" comes from the trimming of shade trees to improve their shape, eliminate dead wood and remove limbs which threaten damage to electric and phone wires. Formerly this brush was piled into trucks and hauled away to be burned. It was necessary to assign part of the crew to this disposal work, which often involved six or eight truck trips daily. Many tons of potentially useful organic matter went up in smoke. Today a crew of six or seven men put in a full day at trimming; limbs are fed into a chopping machine behind a truck; and at the day's end the truck makes one trip, carting about eight cubic yards of shredded wood to the nursery. This receives the same treatment as the leaf piles but the digesting process requires four years instead of two. There is a considerable saving in man-hours, hence dollars, in this method of handling tree trimming operations.

● **SHADE TREE plantings are well back from the sidewalks so that the roots will not damage walk or curb and limbs have minimum interference with overhead wires.**

Leaf mold becomes the basic plant food in all the Commission's planting and growing operations. First, it is used liberally in the Village nursery to feed the young stock. Many truckloads are carted away to insure better health and growth for an average annual planting of 400 new shade trees, 450 shrubs and 200 evergreens. But the biggest beneficiaries by far have been Ridgewood's 35 acres of parks—which include a 2-acre swimming pool; and 35 acres of school grounds and playing fields. Huge quantities of this "manufactured humus" have been used.

There have been especially heavy drafts on the stockpiles during the last three years when a major project was developing on 18 acres of new park area around the municipal building. The ground here was part fill and part newly graded with raw subsoil. Over the remainder there was some topsoil, but thin and of mediocre quality. It needed improvement. Builders in new residential districts seem to think that they have provided adequately for a lawn when they spread an inch or two of topsoil and seed it. Or, at any rate, they get away with it, while owners of new homes struggle along for years with thin and vanishing grass. Mr. Leuning and his crew use no such skimpy methods. Their objective is to build deep-rooted and enduring turf suitable for park use—without "keep off the grass" signs.

To insure this the filled land and the raw and inert sandy clay areas received a rich and thick top coating. First, topsoil was purchased, hauled in and spread to a depth of three or four inches. On top of this came a layer of leaf mold three inches thick. This was plowed and harrowed in thoroughly. Leaf mold also was used to build up the organic content where there was some topsoil, but of indifferent quality.

Mr. Leuning gives one kind of illustration regarding the dollar value of the home-made humus in this way. A cubic yard of soil three inches thick will cover 108 square feet. Hence 403 cubic yards are required to cover an acre. Since topoil costs $3.25 per cubic yard, three-inch coverage for an acre would cost about $1,300. And the saving of that sum by substituting leaf mold would rate as a credit on the Village ledger for every acre of the new park which needed the complete soil rebuilding treatment.

But that, obviously, is only a part of the dollar story. The topsoil bought contained about 20 percent organic matter. Leaf mold is 100 percent organic matter, five times as rich in plant food values. Humus sells for $20 to $25 a ton. An equivalent dollar value on the leaf mold probably would be $15 to $20 per cubic yard. (Estimated on the basis of a weight of about 1,500 pounds per yard.)

The annual leaf crop, as noted, processes into about 1,200 cubic yards of leaf mold. There is indicated here, therefore, an *annual* "soil bank" deposit which in the open market would have a value of $18,000 to $24,000.

Another important contribution to the municipal soil bank comes from the sewage disposal plant in the form of sludge. In many communities in the country this still is regarded as waste matter and a nuisance, to be disposed of in the easiest possible way. Here sludge is stockpiled as a useful and valuable product. About every two years some 250 tons of dried sludge is hauled from the disposal plant to replenish the nursery stockpile.

In an article on sludge disposal in the December, 1955, issue of PUBLIC WORKS it was indicated that—based on per-pound prices of nitrogen, phosphorus and potash—this "waste matter" actually has a chemical fertilizer value of about $20 per ton. It also contains many trace elements of minerals not present in many chemical fertilizers; it has useful soil conditioning properties; and it makes a big contribution in the form of high-quality humus. It is used in the planting of thousands of shade trees, shrubs and evergreens; and, has been found to be especially valuable as a top dressing in building and enriching lawns in park and schoolground areas.

It is difficult to evaluate these added-bonus contributions; but, based on costs of major fertilizer chemicals only, this biennial collection of sludge might be rated as a $5,000 deposit in the bank—or, $2,500 per year—for use as needed.

Mr. Leuning strongly advocates establishment of municipal nurseries. He notes that generally this will not involve cash outlay for a site since nearly all municipalities own land which is not suitable for residential development on which trees can be grown. Ridgewood's 6-acre nursery is located on a brookside tract which belongs to the Water Department and is the site of some of the deep wells which supply the Village and several adjoining boroughs. It "costs nothing" to use the land twice.

The Commission buys and sets out about $1,000 worth of young stock—shade trees, shrubbery and evergreens—each year. Maintenance cost is about $1,000 a year. Since the total of growing stock usually is about 5,000, the cost of care is about 20¢ per plant per year.

Shade trees are bought as "whips", 5 or 6 feet high, at costs of 75¢ to $1.50, depending on type and size. They are set out 6 feet apart in rows 7 feet apart. On the average they are ready for transplanting along the streets in 4 to 5 years. They are

● **AT THE NURSERY approximately 5,000 shade trees, shrubs and evergreens are grown to transplanting size. The nursery is located on a six-acre tract of land.**

● **MUNICIPAL PARKS in Ridgewood have over 1,000 trees and there are 25,000 more shade trees along the streets, all cared for by the Shade Tree Commission.**

then 12 to 15 feet high, with trunks 1½ to 2 inches in diameter. A commercial nursery charge for trees of that size would be $6 to $7 each.

It pays to grow your own. For simplicity in figuring let's assume an average "whip" cost of $1.25 and an average price of $6.50 on trees of transplanting size. The difference is $5.25, which represents appreciation through growth in the nursery. Since 400 such trees were planted last year the credit entry in the Commission ledger was $2,100. Last year and every year, because the average planting is 400 trees annually.

Some trees are held longer in the nursery, 8 or 10 years, because larger trees are wanted for park and schoolgrounds transplanting. Mr. Leuning pointed to a newly planted elm near the municipal building. The trunk was more than 6 inches in diameter and the tree nearly 25 feet high. The commercial nursery price on that one, planted, would be at least $150. In carrying out the park expansion program the Commission transplanted 75 trees of that approximate size last year. The commercial nursery range on these would be $100 to $150. Again, for simplicity in figuring let's pick an average price of $125 and we get a total commercial nursery price of $9,375 for the year's planting of the larger trees. Subtract the 10-years-ago price for the "whips" and the figure still is nearly $9,300. Add the $2,100 mentioned above as gain on the smaller trees and we have $11,400 as a 1955 credit entry in the ledger for shade trees grown and set out.

The conservative Mr. Leuning, anxious that no unwarranted claims be made about Commission work and benefits, quickly points out that it costs about $40 worth of labor to plant each of the larger trees. Holes are dug, 4 to 5 feet across and 2 feet deep, dead subsoil is removed and topsoil and leaf mold substituted.

All right, Superintendent, the planting cost now has been mentioned, so let's summarize performance in this way:

Starting with a cash outlay of about $600 for "whips", the Shade Tree Commission know-how, Mother Nature and *expert crew labor* created for 1955 a gain in values of more than $11,000 as measured by prices prevailing in the shade tree market place.

Showing, as mentioned, that it pays to grow your own.

There are other gains. If you operate your own nursery you can experiment, you can throw out culls, you can plan ahead for what you are going to need in years to come and your trees go into the ground fresh and vigorous. When municipalities buy their shade trees from commercial nurseries generally they must travel some distance by freight car; they must be unloaded, hauled, heeled in somewhere and watered and cared for until they can be planted. They are likely to be out of the ground for days, or even longer, involving set-backs in growth and probably some loss. Also this means higher labor costs in handling.

In Ridgewood, trees move from the nursery to their permanent homes, roots embedded in rich soil, in a few hours. They don't know they've been out of the ground.

And they will *not* be planted between sidewalk and curb where their growing roots may damage both; where there is virtually no food in the soil and little moisture, because rains run off; and, finally, where limbs will provide maximum interference with phone and electric wires. Under present practice, trees are planted back some distance from the sidewalk. This gives them a better chance and provides, as they grow, a better view, a broader vista, down the street. Beauty also rates as a credit item, though not easily measured in dollars.

Recalling and summarizing, the dollar value entries in the 1955 ledger which have been mentioned above are: In leaf mold, $18,000 to $24,000; from sludge, $2,500; through tree growing, $11,400; total, $31,900 to $37,900.

These figures, of course, do not represent credit deposits which can be withdrawn in cash. But they do represent solid and tangible values which have been created by the Shade Tree Commission for the benefit of the people of Ridgewood. The Commission budget for all operations last year was a bit under $70,000. The "values created" figure is equal to about half that sum. It is a good return.

● **YOUNG "whips" growing in the nursery. They stay here 4 to 5 years.**

With weather extremes and local conditions stacked against you, roadway maintenance presents trying problems for the county engineer. It's lucky that Mr. Thomson keeps his sense of humor. Chuckle with him as you read . . .

ROADWAY AND GROUND MAINTENANCE

PAT THOMSON, Douglas County Engineer, Waterville, Washington

THERE ARE THREE major factors that influence the maintenance requirements of any area: the general economy of the region; its topographical location not only in elevation range, but in type of terrain; and the soil characteristics as influenced by the seasonal climatic conditions. None of these are controllable by the authorities responsible for conducting maintenance. They have to be met and endured each season. Preventive maintenance can forestall some major conditions, but only if the battle is unceasing.

To paraphrase Sherman, maintenance in Douglas County is plain, ordinary hell. This is largely because of the highly unpredictable climate reactions that are always at the extreme ranges of the weather scale. It either doesn't snow at all, or it starts snowing November first, and does not stop until it is waist deep to a seven-foot Indian standing on a totem pole. It doesn't rain for months on end until every footstep chokes you on a cloud of dust; or the sky splits in a series of cloudbursts dropping as high as five inches of rain in two hours. Summer temperatures reach a blistering 110 degrees, making you a candidate for the next Antarctic expedition; or a forty-mile-an-hour wind at 32 degrees below makes a blast from the door of the fiery furnace welcome. In Douglas County, extremes are the natural occurrence, and there is no seasonal pattern. No two same seasons react alike, so that possible predictions can be made on what to expect. I have classified our maintenance producing factors into three general groups: those causing extreme maintenance; those handled by regular maintenance procedure; and those with unusual maintenance factors.

Probably our worst conditions are caused by heavy moisture and no snow in the fall, coupled with a late heavy snowfall. This climate condition allows the ground to freeze to a depth of as much as two feet. The heavy snow fall is not sufficient to pull the frost from the ground except to a depth of about six inches. The subfrost then holds the water suspended in the top of the subgrade. Even on bituminous surfaced streets ballasted with 1¼-in. aggregate, it is as though a shallow stream ran under the oil mat. This causes an excessive breakup, particularly in light bituminous projects.

Heavy snowfalls under these frost conditions are no blessing to anyone, even the farmers. For the frost allows no percolation into the soil. Every drop has to run off. And it does, with ordinarily dry channels running six to eight feet deep. Normal channels, usually contained in an 18-in. pipe, overflow the road, eroding the shoulders and causing surface damage.

Or we have a series of spring chinooks creating a freeze-thaw situation that produces bogholes in even the best graveled roads. When certain portions of the clay soil are super-saturated, the crushed aggregate drops from sight.

The repair of these washouts and bogholes requires a special attention in the spring with a specialized equipment. We utilize a motor patrol equipped with a front-end dozer. Thus, in the first spring blading, should a patrol come across a washout it cannot cross, the operator has some opportunity to side borrow to fill the hole. Except for re-graveling, the maintenance is complete.

Should the patrol encounter a washout too large to doze in expediently, the operator builds a path and goes on his way. To fill these cavities, and the boggy spots requiring re-ballasting, we have an efficient system. Our Pettibone-Mulliken 1¾-yd. loader is easily operated. In this instance, the loader is taken to the aggregate pile and left. One truck driver, doing his own loading, can cover a maximum area in minimum time.

Very Dry Summers

Exceedingly dry summers, such as the one in 1955, cause us extreme difficulty in surface maintenance. Most of our crushed rock surfaced roads are also heavy wheat haul farm-to-market routes. Under normal moisture conditions, the crushed aggregate combines with the clay binder to create an almost concrete-

● **SPRING maintenance starts while the roads are still wet, before snow leaves the ground. Opposite page: Ditch cleaning uses truck fleet and a half-yard shovel.**

like surface. This requires very little summer maintenance.

However, in seasons when the dust begins to blow in February, our troubles also begin. Even constant blading will not prevent the roads from corrugating under the 150-300 bushel loads of wheat pounding them. Our best procedure is to carry what we term a "maintenance wrinkle". We cut through the corrugations, carrying the resultant windrow of aggregate across the road. To spread it out is only inviting more immediate corrugating. On the next blading, a few days later, we carry this wrinkle back across the road again, leaving it on the other side. In this manner, by blading often, we can keep relatively smooth surfaces.

But with some 900 miles of road maintained in such a fashion, it sometimes presents a fall problem in getting all maintenance wrinkles spread out before snowfall. Otherwise, in the first snow, we could and would scale off a large portion of our gravel surfacing.

Cloudbursts, luckily, are not a yearly occurrence. An occasional late June or early July series of cloudbursts raises havoc. Fortunately, these are confined to areas of 40 to 60 square miles. However, the effects are felt throughout the course of each water channel originating in the cloudburst vicinity.

It is economically impossible for us to build to sustain these cloudburst flows. Consequently, practically all the pipe drainage structures across these affected channels wash out. So when the ominous black cloud drifts over the southern ridge of Badger Mountain, we rush out and check the culvert stockpile, resigning ourselves to a speedy replacement program.

Routine Maintenance

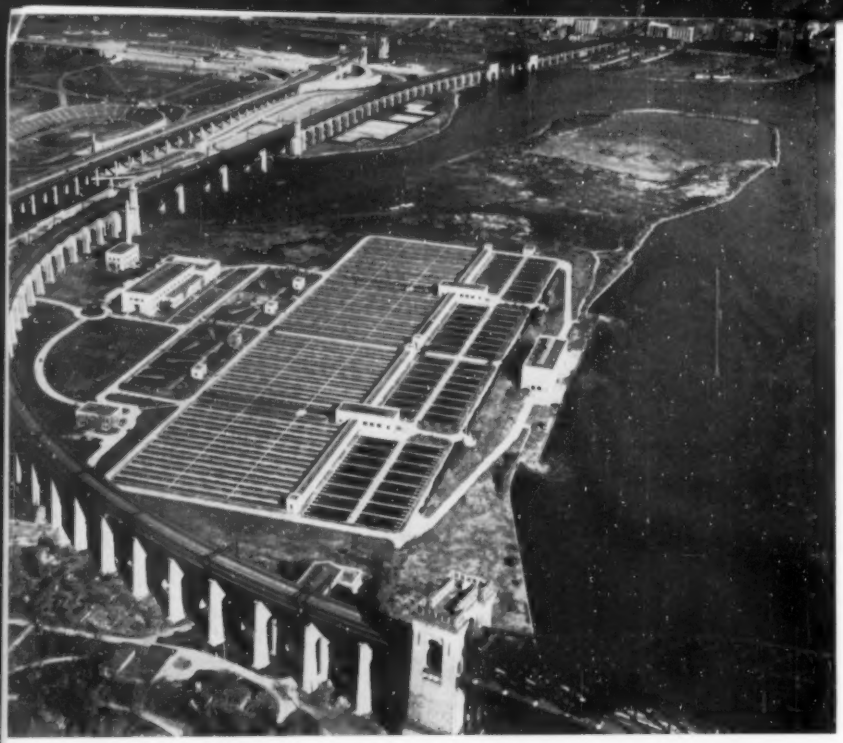
These four unusual features causing extreme maintenance are at least challenging. The daily routine maintenance is vitally necessary, but nevertheless, dull in character. All roads, oiled and graveled, are shouldered, ditched, and backsloped each season in so far as conditions allow. Culverts are checked for condition and capacity. This is a preventive maintenance that saves dollars when the water is running; and keeping the subgrade squared away allows less opportunity for deterioration. Between blowing soil and farmers plowing up to the ditch line, the preservation of ditches is a continual item.

Roadside maintenance consists largely of weed control. Weeds are not a difficult deal with us, with Russian thistle (tumbleweed) our biggest bother. We tried spray treatment with very unsatisfactory results. Consequently, we now allow the thistle to grow about four inches and then blade from ditch line to ditch line. This appears to get the bulk of it, and subsequent blading from shoulder to shoulder eliminates the problem. If small patches of noxious weeds are discovered, they are immediately chlorated. Since the agricultural economy makes the farmer very conscious of noxious weeds, these infected spots are usually detected by the land owner. Consequently, the general procedure is that we supply all materials and the farmer does the actual treatment. This method of control has proven very satisfactory.

Since adequate headroom has always been a problem, all our pipe replacement has been of the arch variety. We find that we can use one diameter smaller, for in flat bottom pipes, the majority of the water is

(*Continued on page* 156)

● **RADIO has become the lifeline of operations, both for maintenance and force account construction. Proper servicing of the equipment is a maintenance essential.**



● **WARD'S ISLAND sewage treatment plant, a major unit in New York City's pollution control program.**

The postwar capital construction included a $344,000,000 pollution control program. While the peak of our postwar construction has passed, there are plenty of challenges ahead. The second phase of the pollution control program, opening in 1956, will involve an estimated expenditure in excess of $200,000,000. To complete this program by the end of 1964, as we hope to, will require not only assured financing but also considerable feats in expediting the design and construction of the necessary treatment plants and interceptor sewers.

We also have ahead of us the balance of the city's 10-year program of construction of new, and modernization of old, incinerators, coupled with construction of shore-front loading stations—for removal of incinerator residue and of garbage which still is not incinerated. More than $2,000,000 are allotted in the current capital budget for these purposes. This program through 1961 will involve additional expenditures estimated at about $55,000,000.

Financing

NEW YORK'S POLLUTION PROGRAM

FREDERICK H. ZURMUHLEN, P. E., R. A.,
Commissioner of Public Works, New York City

VARIOUS ENGINEERING marvels of New York City are frequently spot lighted and widely discussed. Each facility mentioned is signaled out because of some out-of-the-way feature, or some extraordinary element. But for each one that is hailed as a wonder of the world there are hundreds or thousands no less marvelous though they are without obviously unusual features.

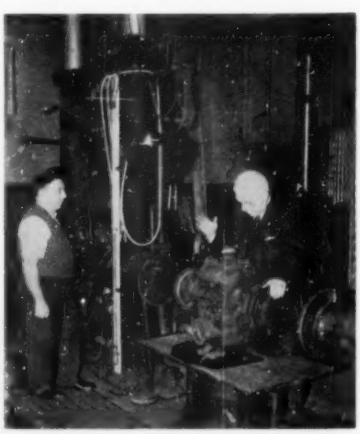
New York City could not exist without engineering and engineers. Its viability is due to the wonders of engineering—some plain, some fancy—but all of it essential to the functioning of this metropolis.

Most of us take for granted our water supply system which brings water to our taps from points as distant as 150 miles. And we take for granted the 5,500 miles of water conduits under the city streets and the 5,000 miles of sewers.

These engineering marvels are so basic to the existence of our city that we become conscious of the vital role they play in our lives only when something goes wrong with them.

A city such as New York is constantly improving or adding to its facilities. A major share in this improvement and expansion program falls to the Department of Public Works. We are responsible for the design, construction, operation and maintenance of all toll-free bridges over navigable streams (we have 50 such bridges); and for the design, construction, operation and maintenance of sewage treatment plants and interceptor sewers (we have 11 modern treatment plants at present).

The magnitude of the projects which the city has to provide and the magnitude of responsibilities is indicated by the fact that since construction was resumed in 1947 after World War II and until the end of last year, we awarded work contracts for $433,000,000, of which $365,577,000 was completed.



● **TESTING accuracy of a 4-inch turbine meter used for industrial installations. Commercial users are metered and charged for amount of water used.**

But these capital improvements are all contingent on the availability of capital construction funds. The funds come out of borrowing for periods covering the minimum anticipated lives of projects and may extend to 30 years. However, by law the city's borrowing power is limited to 10 percent of the average assessed valuation of real property during the latest five years.

This limitation has long been a straitjacket on new construction in the city. Authorities have been formed so that essential jobs that had to be done could be carried out. A law was passed to exempt self-sustaining projects from the debt limit; and we resorted to the so-called sewer rent tax to finance construction and operation of water pollution control projects.

When the income from the tax proved insufficient to finance construction and operation of the treatment works and also the maintenance of the sewer systems under the jurisdiction of the Borough Presidents, the city dipped into the regular capital funds—that is, those within the debt limit—to make up the difference.

Last year, another solution seemed possible. A constitutional amendment was proposed to exempt funds for sewage treatment works from the debt limit, but it was defeated.

So here we are faced with the fact—as the city planning commission has warned every city department—that the exempt funds have been fully committed, or practically so, and we must now either shelve vitally necessary projects or find some way out of the dilemma.

I don't know the answer to the whole problem. But insofar as the pollution control program is concerned—a program whose prosecution is entrusted to me—I must say that I cannot see how in good conscience or good faith we can defer any part of it any longer than we have already outlined to the Interstate Sanitation Commission.

Completion Goal—1963

We are under orders by the ISC to complete the entire program to clean up the waters around the city by 1959. For various reasons, chiefly the shortage of engineers and financing, this goal cannot be met. So Mayor Robert Wagner has applied to the ISC to stretch out the program to 1963. However, even this aim is endangered if undertakings like the $80,000,000 Newtown Creek pollution control project, designed to serve parts of Queens, Brooklyn and Manhattan, have to compete for capital funds with schools, libraries, health centers and similar public improvements.

I do not feel that the Interstate Sanitation Commission will give us any extension beyond 1963 to complete the remaining sewage treatment works; they have not yet granted the extension even to 1963. So it is fairly evident that some means must be found to finance the balance of this program by that date.

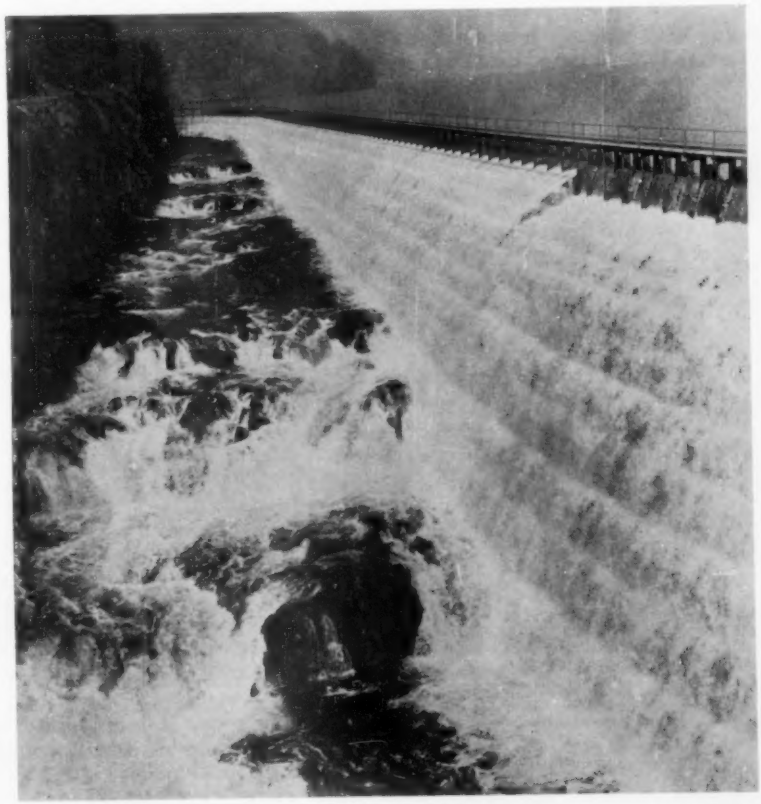
The straightforward answer is to increase the sewer rent tax, which is really not rent for anything but a charge for sewerage service and sewage treatment. Doubling of the present rate of one-third of the water charge would bring in sufficient revenue, we estimate, to finance the program.

Assuming a one-family home owner has a water bill of $19, his present sewer rent tax per year of $6.35 would be doubled. Is $1.06 a month too high a price to pay for clean waters, for safe bathing beaches and vast areas, such as Jamaica Bay, reclaimed for recreation, as well as the increase in property values? I think not.

It may well be, I recognize, that many small home owners would find an increase in the tax a hardship. But there is a remedy within their reach. They can cut their water bills *and* the sewer rent tax if they install water meters instead of being billed for water on the basis of frontage, number of stories and outlets. The initial investment for the meter would soon pay for itself. Metering is the only logical and fair way to measure water consumption. And since the water consumption of a household is its exact contribution to the sewerage requirements, it is also an exact measurement for purposes of computing the sewage treatment tax.

The advantage of installing a meter is that the home owner need not wait for others, or for everybody, in order to obtain immediate relief; and the saving he effects on his water bill gives him proportionate relief on his sewer rent charge at the same time.

We *must* complete the program within a reasonable time—and that looks like 1963—unless we want to penalize ourselves by cutting other essential contruction. We must face squarely and courageously the only immediate alternate in sight—an increase in the sewer rent tax.



● **SPILLWAY of the Croton Aqueduct, part of New York's water supply. A charge based on actual water usage is suggested as an equitable sewerage financing plan.**

Planning better roads

by **INTERNATIONAL SALT COMPANY, INC.**—America's largest producer of salt

Stabilizing Base Course with Rock Salt Is Efficient, Economical

An increasing number of states and highway departments are now using rock salt to stabilize road base course. The main reason for this is that rock-salt-stabilization gives the base course complete, long-lasting protection against extremes of temperature and weather. Rock salt actually combines with soil to give it added density, water-tightness, and resistance to frost. Result: roads that stand up longer . . . and need less maintenance.

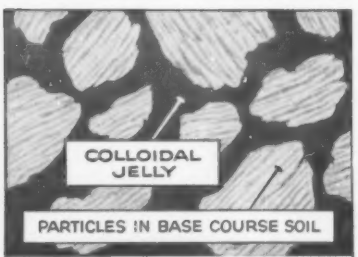
Rock salt provides this remarkable stabilization in three different ways—conforming to severest weather conditions. Here they are:

During heavy rains the salt and clay in the stabilized soil form a colloidal jelly. This jelly acts as a barrier to the seepage of further moisture from any direction. As a result, the stabilized base is actually sealed off from water damage.

In extremely dry weather, salt in the stabilized base recrystallizes and holds the soil fines in place. Thus, the original density of the soil is maintained. This recrystallized salt also shields the road base from heat, helping to preserve necessary moisture in the lower layers. Partially recrystallized salt also fills the natural voids that occur in road base during temperature changes. This is another way "potholing" is prevented.

In freezing weather, frost cannot readily penetrate rock-salt-stabilized soil. This is because salt acts as an antifreeze, lowering the soil's freezing point. With salt-stabilized base courses, the occurrence and severity of frost heaving are greatly reduced—and resultant surface breakup is minimized.

Economical, too. Another important reason for the growing popularity of rock-salt-stabilization is its low cost. Rock salt itself is an inexpensive and readily available material—and applying it to roads requires no special equipment. This method of stabilization can generally be accomplished quickly and conveniently, too—thus reducing equipment and labor costs. And after stabilization with rock salt, road maintenance expenses are often substantially decreased.



Rock Salt on the job. Enlarged diagram shows how rock salt forms a colloidal jelly with base-course soil. This protective colloidal jelly is one of the important features of salt-stabilized roads.

ROCK-SALT-STABILIZATION PERMITS ROADS TO BE BUILT IN STAGES

This is an important feature in many road-building or reconstruction programs. Because the salt-stabilized base course is hard, smooth, and long-wearing—it can successfully be used as the wearing course for as long as several years. When the bituminous or concrete wearing course is finally applied, the base course provides all the advantages detailed here.

This heavily traveled gravel road in the Midwest was stabilized with Sterling Rock Salt, produced by the International Salt Company. Road surface is reported to be hard, smooth, and virtually dustless. It now requires only infrequent maintenance.

Free Technical Assistance on Road Stabilization

International Salt Company will be glad to help you work out an effective, economical rock-salt road-stabilization program for your system. There's no cost or obligation. Just contact your nearest International sales office.

For further technical information on rock-salt stabilization, write for International's free series of booklets "Better Highways." Address: International Salt Co., Inc., Scranton 2, Pa.

Sales offices: Atlanta, Ga.; Chicago, Ill.; New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Cleveland, O.; Philadelphia, Pa.; Pittsburgh, Pa.; and Richmond, Va.

FOR ROADS, INDUSTRY, FARM, AND HOME—

STERLING SALT

PRODUCT OF INTERNATIONAL SALT CO., INC.

NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Highlights of 1956 Public Works Congress

THE 62ND ANNUAL Public Works Congress and Equipment Show, held in Fort Worth, Texas, in September, was one of the most successful meetings ever sponsored by the American Public Works Association. Over 1500 persons from all parts of the United States and Canada and from Europe and South America attended this outstanding event, which featured the largest display of public works equipment ever assembled in the Southwest. The delegates and their wives were given a royal welcome to the Lone Star State, complete with a barbeque and rodeo, by the Local Committee headed by Mayor F. E. (Jack) Garrison, City Manager Frank Davis, C. M. Thelin, Director of Public Works, and W. O. Jones, General Manager of the Fort Worth Chamber of Commerce. A wide variety of topics were discussed at the three-day meeting which was gavelled to order on Monday morning, September 24th by President Edward P. Decher, Secretary of the Joint Sewer Commission of Newark, New Jersey.

Eisenhower Message

A special message from President Dwight D. Eisenhower was read to the delegates which paid a glowing tribute to the membership of the Amercian Public Works Association. The message said that the subject of public works is of great interest to the President because of its effect on the daily lives of all our citizens. It went on to say "We have a tendency to forget the benefits accruing from the thousands of public works systems across the Nation. But the very fact that these public services are taken for granted is testimony of their efficiency . . . and to the capability of those who build, maintain and operate them. So, for the citizens of our Nation, let me pay tribute now to your devoted efforts and to the efforts of men like you."

Fringe Areas

One of the highlights of the Congress was a forum on "Integration and Coordination of Public Works". Mayor Ben West of Nashville, Tennessee was Chairman of the forum which began with Dennis O'Harrow, Executive Director of the American Society of Planning Officials, discussing the reasons for the establishment of special districts and authorities. He concluded that the problems resulting from urban growth in the next forty years will be "magnified in direct ratio to the number of independent, single-function districts and authorities trying to solve them." Ed Reid, Executive Director of the Alabama League of Municipalities supported this viewpoint by explaining that the cities in that State rely on extraterritorial powers to meet their fringe area problems and have virtually no laws on their statute books authorizing the formation of special districts.

Dr. August O. Spain, Chairman of the Department of Government of Texas Christian University, discussed the unilateral annexation law of Texas, which permits home-rule cities of over 5,000 population to annex adjacent lands by the enactment of an ordinance regardless of the will of residents or owners thus affected. He pointed out that

● **POPULAR "Shirt Sleeve" sessions lived up to the name. It was hot in Texas!**

OFFICERS: Robert Anderson, Winnetka, Ill., *President;* Sol Ellenson, Newport News, Virginia, *Vice President.* **REGIONAL DIRECTORS:** (three year terms) Albert G. Wyler, New Orleans, La.; Wm. D. Hurst, Winnipeg, Manitoba, Canada; Frederick Crane, Buffalo, N. Y.; (two year terms) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (one year terms) K. K. King, Phoenix, Arizona; Charles W. Cooke, Hartford, Conn.; R. V. Moschell, Alcoa, Tennessee. *Immediate Past President,* Edward P. Decher, Newark, N. J. Donald F. Herrick, *Executive Director.*

some of the problems under the present law might well be resolved by the enactment of legislation requiring central city approval of any proposed new incorporation within a 5 or 6 mile zone. This, he said, would prevent incorporation within fringe areas and also diminish competitive annexations. The fourth participant on the forum was City Engineer Lyall Pardee of Los Angeles who discussed the use of intergovernmental agreements in solving urban area problems.

Advance Planning

Major General J. S. Bragdon, Special Assistant to President Eisenhower told the delegates that our population growth in the 35-year period from 1940 to 1975 will have added 90 million persons. There must be developed, he said, a rational and practical method by which state and local units of government can determine what public works are needed and should be programmed from year to year. The development of a range and selection of specific criteria is a cooperative inter-governmental action. Within a basic guide range supplied by the Federal Government, a State government might refine these data based on local conditions and furnish them to communities, who in turn would select the specific criteria upon which to base their forward planning.

Employee Training

Herbert A. Olson, Field Representative of the Public Administration Service of Chicago, in discussing organizational problems, said—"The sustained interest by public works officials in problems relating to the proper grouping of activities and internal organizational relationships indicates a consciousness of defects in existing organization patterns and an urge to improve administrative procedures and practices." This attitude among the membership was in evidence at the forum on "Employee Development in Public Works", which was chaired by Sam Gentile, Administrator of the Department of Public Works of Detroit. "We have come a long way since the time when we simply "broke in" our employees," said W. D. Heisel, Personnel Officer for the City of Cincinnati. "We have come to see that the more an executive develops his subordinates, the bigger he grows . . . we have come to realize that training is good business." He then discussed various ways of analyzing training needs. This was followed by an informative talk on training methods by Robert Garnier, Assistant Personnel Director of Milwaukee. The Training and Education Administrator of Miami, John E. Miklos, said "training should be made attractive and useful, not only in aiding the employee in increasing his job skills but also his self-development. Once the employees can see the purpose and the value of the training to them, they will undertake it not only voluntarily but enthusiastically."

Streets and Highways

The Federal Highway Act of 1956 was discussed by Alanzo C. Taylor, Division Engineer for the U. S. Bureau of Public Roads. He explained that the Federal Government, under this new legislation will contribute some $33 to $35 billion to the States for road construction over the next 13 years. The stepped-up program will be financed out of a Highway Trust Fund into which will go a number of new or increased highway user taxes providing an estimated $14.8 billion in new revenue over the next sixteen years. "One of the principal foreseeable delays," he said," will be the acquisition of the necessary rights-of-way, particularly in large cities. Since the large cities represent the focal point of the principal traffic congestion it is here that we must concentrate our efforts."

City Engineer Stanley Palmer of Kansas City, Missouri, said that although his city is in wholehearted agreement with the design criteria for the highway program developed by the AASHO and adopted by the Bureau of Public Roads, the application of the criteria may present some problems. "We feel," he said, "that any highway built through our urban area will be used predominantly by the people in the area; therefore the location, layout and design should provide for the maximum usage by local traffic instead of major design emphasis being placed on providing a highway for through or interstate traffic through the urban area."

Andrew W. Mulrain, Commissioner of Sanitation for New York City explained how the nation's largest city is attacking the litter problem. One of the steps taken was to purchase 80 passenger tow trucks to "enforce" regulations forbidding parking of cars on several hundred miles of streets during certain specified times so that the streets can be properly cleaned. City Engineer Hugo Erickson of Minneapolis, who led a lively discussion on street sanitation problems, said that cities are caught in a squeeze of limited or fixed funds, mushrooming costs, and demands for more and better services. He also pointed out that the street cleaning crew in his city is about one-third the size of the crew they had in 1940, which clearly indicates the growing importance of modern equipment in street sanitation operations. Ways and means of getting full value for the money spent on public works vehicles was the subject of another interesting discussion led by Thomas Baldwin, Chief of Automotive Maintenance for the City of Philadelphia.

Arthur D. Harrington, Public Lighting Engineer for the General

● **MANUFACTURERS' exhibits in the Coliseum. In addition to this building, a large exhibit hall was filled with displays.**

Photo and Report by Interstate Industrial Reporting Service

Georgia red clay — often studded with quartz and granite — "routine" for Cleveland owner

CONCRETE CONSTRUCTION CO. of Atlanta, Georgia, recently completed a trench excavating job for the installation of a gas main in the North Druid Hills near Atlanta. "This area," says a report from C. V. Lanier, field superintendent for Concrete Construction, "contains quartz and—since the spine of Stone Mountain underlies the district—chunks of granite. But, using one of our Cleveland 95's, we consider it just a routine job." Concrete Construction currently operates nine Clevelands, three 92's, four 95's and two 110's. Mr. Lanier's report continues:

"Trencher operations constitute the basis of our business—and to us that means Clevelands. Mechanically, we have never had a Cleveland halt in the field."

Performance like this proves again that Clevelands dig *more trench . . . in more places . . . at less cost.* Talk it over with your Cleveland distributor.

Good Everywhere

THE CLEVELAND TRENCHER COMPANY

20100 St. Clair Avenue • Cleveland 17, Ohio

Electric Company, led a discussion on street lighting and pointed out that the average urban street is a dark, gloomy uninteresting and perhaps dangerous place nearly 46% of the time. Authorities in the field, he said, have computed that if all streets were modernized to minimum standards, public lighting would require a total per capita cost, ranging from $2.50 for the larger communities to approximately $4.00 for smaller towns. City Engineer Roy McLeese of Salt Lake City, in another session, pointed up the growing importance of street maintenance activities by explaining that reports show that cities are spending about twice as much on street maintenance as they are on the construction of new streets and highways. P. M. Linscott, Project Engineer for the consulting engineering firm of DeLeuw, Cather & Company of Chicago, told the delegates that traffic congestion in downtown areas can be materially reduced by easing the problem of entering and leaving off-street parking facilities.

Electronics

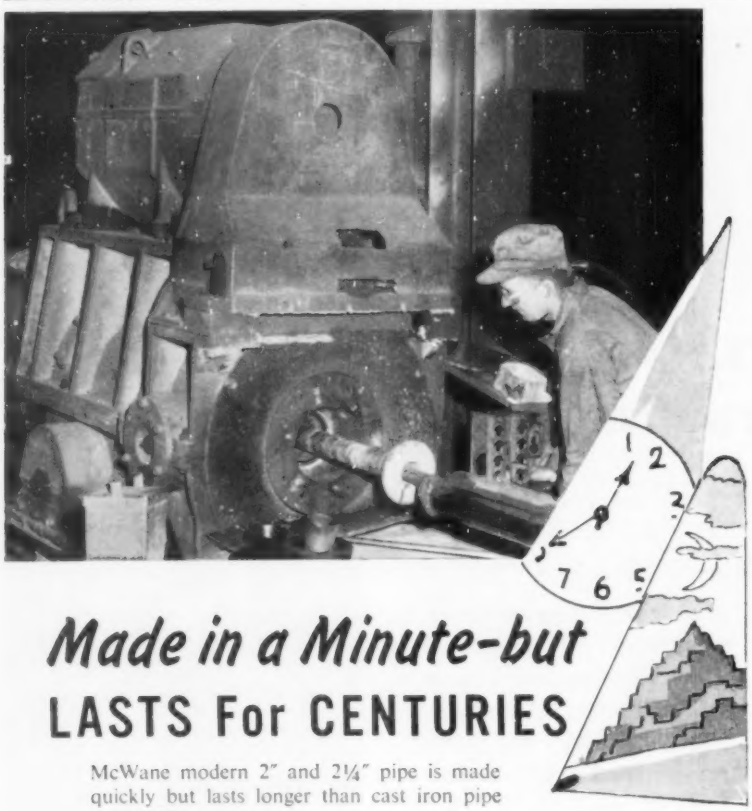
Howard Jacoby, Associate Editor of Engineering News-Record, told the delegates that computers will, in his opinion, become the most useful of all electronic tools to public works men. Some of the engineering applications of computers, he said include: calculation of design and pay earthwork quantities in highway construction; conversion of rod readings to elevations, traffic density studies, analyzing water distribution systems, and preparation of construction cost estimates, to mention but a few. Many applications of telecommunication, including radio, television, telemetering and radar, were also discussed.

Refuse Collection and Disposal

The membership was honored by the presence of Norman G. Wilson of Edinburgh, Scotland, who reported on public cleansing practices in Great Britain. Mr. Wilson, who is President of the International Association of Public Cleansing and is Engineer and Manager of the Lighting and Cleansing Department of the City of Edinburgh, said there are three great needs in the refuse collection field the world over—"to make the work more attractive, to remove the stigma which it confers, and to pay sufficient to compete without handicap in the labor market."

Leo Weaver, Sanitary Engineer for the U. S. Public Health Service led a discussion on refuse disposal practices and said that the increasing rate of installation of household food waste grinders indicates that by 1965 almost 50 percent of the urban population will be using this method of garbage disposal. He also pointed out that present data show that refuse from some 70 million persons in this country is being disposed of by incineration or by the sanitary landfill method of disposal. City Manager Frank Davis of Fort Worth explained that the financing of public works programs is becoming more and more difficult, and that his City is now collecting about $1.5 million a year from their refuse disposal service charges (the basic residential fee is $1.25 per month) thus relieving the property tax rate by about 27 cents.

Warren Schneider, Director of the Bureau of Sanitation of Los Angeles, said that "Diligent study should be given to the characteristics of each type [of refuse collection body], particularly those directly affecting the performance of collection employees. These include the speed and efficiency with which



Made in a Minute-but
LASTS For CENTURIES

McWane modern 2" and 2¼" pipe is made quickly but lasts longer than cast iron pipe made 100 years ago.

Batteries of centrifugal casting machines turn out McWane Super-DeLavaud 20-foot cast iron pipe at the approximate rate of 2 pipe per minute. Superior foundry methods and laboratory controls give this modern Small Diameter pipe greater strength, straighter barrels, better joints, uniform wall thickness, sounder metal sections, make it easier to cut and tap. Made either bell-and-spigot or mechanical joints, for IMMEDIATE SHIPMENT. Write or telephone

McWANE CAST IRON PIPE COMPANY
Birmingham, Alabama
Sales Offices: Chicago, Dallas, Kansas City, New York, Birmingham

McWANE 20-FOOT 2 & 2¼ INCH PIPE

Transportation. Over the roughest terrain, through sand, soft earth or mud, in good weather or bad, the Universal 'Jeep'†, with the extra traction of its 4-wheel drive, takes supervisory personnel, work crews, tools, equipment and supplies wherever they are needed. It shifts easily into conventional 2-wheel drive for quick highway travel between jobs.

Ten billion miles of proof!*

One of the reasons why so many 'Jeep' vehicles are used in public service

Hauling and towing. The "go-anywhere" 'Jeep' Truck is the only truck in its weight class originally designed and engineered completely for 4-wheel drive off-the-road travel. It carries one-ton payloads... tows heavily loaded trailers.

Mobile power. The Universal 'Jeep', with power take-off or hydraulic lift, takes power right to the job to operate this trencher and many other types of equipment including winches, grader blades and sprayers or dusters.

Maintenance. The 4-Wheel-Drive 'Jeep' Utility Wagon carries up to 110 cubic feet of bulky cargo, or six passengers. It takes supervisors, workers and tools to maintenance operations other vehicles can't reach.

It's easy to see why economy-minded officials everywhere are turning to 4-Wheel-Drive 'Jeep' vehicles for public works and public service operations. They are the only 4-wheel drive vehicles in their weight class that are time-tested and performance-proved in more than 10 billion miles* of on-the-job transport service. Their "go-anywhere" dependability provides extra insurance in daily public service use and in emergencies.

Only Willys has so many years of experience in engineering 4-wheel drive vehicles in the under 6000 GVW weight class. 'Jeep' vehicles help stretch tax dollars through their long life, low upkeep and high resale value. Ask your Willys dealer for an on-the-job demonstration, or write for information.

The 'Jeep'® family of 4-Wheel-Drive vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

*An understated estimate of the miles of transport service driven by 'Jeep' family vehicles. Some estimates place the mileage at more than *fifty* billion.

†Model CJ-5 shown.

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A precision instrument. Minimum focus is 6½ ft. Magnification is 26x. Readings down to 20 seconds. MODEL T-18, is a Utility Model for only $189.50. Save over $300 on this brand new equipment. Atlas Transits are field tested and accepted by engineers, contractors, builders. Complete with Tripod and Accessories. Sold only on a money back guarantee. Non rated D&B firms--$25 deposit—balance C.O.D. Send to Dept. PWM.

ATLAS INSTRUMENT CO.
611 PEARL ST. SIOUX CITY, IOWA

refuse can be emptied into the body or loading hopper; consideration of the effective loading width; height of the loading edge from the ground; and the overall working space including overhead clearance.

"Consideration should also be given to the degree to which each unit is able to compact the material within the body and the speed with which such compaction takes place, as well as the simplicity and ease with which the compacting mechanism is actuated." He also cited other important considerations, and pointed out that the efficient management of a refuse collection system requires a continuing search for and application of new and/or revised methods of meeting changing conditions.

Droughts and Floods

Water problems resulting from the prolonged drought in Texas were brought to the fore by C. M. Dixon, Chairman of the State Board of Water Engineers, who explained that a great deal of misinformation which is being freely disseminated is not supported by facts. The immediate and most urgent need, he said, is for adequate funds to be made available to collect factual information for use in developing a positive water management policy.

Another feature of the diversified program was a forum on "Drainage Problems In Urban Areas" led by H. H. Stirman, Director of Public Works of Dallas. In this discussion it was pointed out that flood damages will continue to grow in direct proportion with the investments expended in the flood plains of our rivers until we have effected their control. Colonel Harry O. Fisher, District Engineer of the U. S. Army Corps of Engineers then added that this simple fact continues to be ignored and adds greatly to our urban problems. The reactivated flood control program in Hartford, Conn. now being undertaken as an aftermath of last year's flood was discussed by Charles W. Cooke, Director of the newly organized Park River Flood Control Commission. Charles R. Velzy of the consulting engineering firm of Nussbaumer, Clarke and Velzy of New York City explained that the design of drainage for urban areas involves studies of such basic data as topography, rainfall intensity and duration, storm frequency, character of soil, land use and many other factors including the financial feasibility of the project. George L. Nampa, Director of Public Works at Royal Oak, Michigan, said "It should be obvious that all lands, whether flooded or not, in a given watershed should each bear a fair share of the cost of a drain which benefits the area." However, each situation, he said, is a case in itself and must necessarily be analyzed individually and financial planning must be tailored according to the facts as they may apply.

Buildings and Grounds

Jean L. Vincenz, Director of Public Works for San Diego County, California, led an interesting discussion on the management of public buildings and said that the number one problem concerns money. The annual cost for cleaning buildings under his jurisdiction, he said, has been computed to be 40¢ per square foot; utilities which include heat, light, and water, cost 19¢ per square foot; administrative and indirect costs chargeable to the management of these buildings comes to 9¢ per square foot; and maintenance and repair costs average 22¢ per square foot per year. These cleaning and maintenance costs, he said, seem to be in line with the average operating cost figures reported by the National Association of Building Owners and Managers of 47.3¢ per square foot for cleaning and 19.3¢ per square foot for the maintenance and repair of all types of buildings.

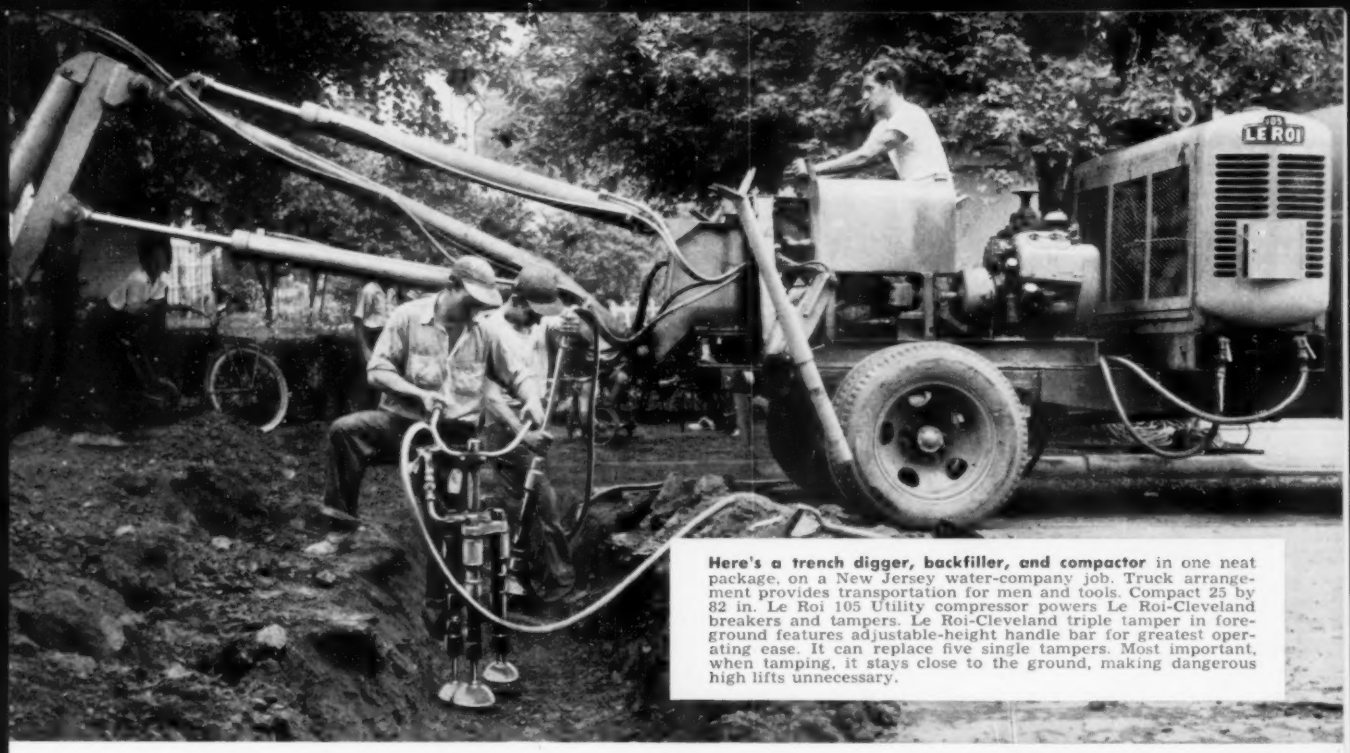
• • •

Collection and Disposal of Garbage and Refuse

The services rendered by the Division of Sanitation of the Public Works Department of Raleigh, N.C. are the most extensive and expensive of any of the services given by the city government. At the close of the fiscal year ending in July there were 3 sanitary landfills in operation and one man at each landfill site. The bull clam tractor operator is held responsible for successful operation of the fill which he operates.

Each load packer operator is responsible for the collection of all garbage and refuse twice each week in the particular area assigned to him. There are four laborers assigned to each truck. Equipment includes 3 Dempster Dumpster trucks, 16 load packers and three 1½ ton dump trucks.

The total cost of operations for the year was $302,279.07. There were 245,856 total cubic yards of refuse and garbage handled. This material is from the 1955-56 Annual Report, Dept. of Public Works, Raleigh, N.C.



Here's a trench digger, backfiller, and compactor in one neat package, on a New Jersey water-company job. Truck arrangement provides transportation for men and tools. Compact 25 by 82 in. Le Roi 105 Utility compressor powers Le Roi-Cleveland breakers and tampers. Le Roi-Cleveland triple tamper in foreground features adjustable-height handle bar for greatest operating ease. It can replace five single tampers. Most important, when tamping, it stays close to the ground, making dangerous high lifts unnecessary.

Work-Saving Air-Tool Applications

by LE ROI

Highway construction in Mexico is frequently for the birds, or literally could be as this picture indicates. Two operators pictured on this treacherous perch rely on easy-handling Le Roi-Cleveland sinkers, as do 38 others on job. To complicate the fatigue problem, this area around Chilpancingo is often subject to extreme heat. Sealed dust-proof feature is one reason why these tools produce the powerful, constant rotation needed for fast drilling.

On this $1,600,000 Cleveland sewer job, Le Roi-Cleveland clay diggers set a daily 20-ft. pace. The C-10 clay spade was chosen because a great deal of handling and lifting were required. Operators appreciated a well-balanced tool for this rush job. The spade also is free from bumps, so that operators can get a firm grip and still work close to tunnel walls.

Gas company employee breaks through tough 12-in. concrete. To speed emergency repair work, this utility chose the maximum shattering impact of a Le Roi-Cleveland 52 paving breaker. Work speed, however, was only one consideration. Low-cost operation was important too. The 52's piston air-cushion reduces internal part wear, makes handling easier.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

RD-81

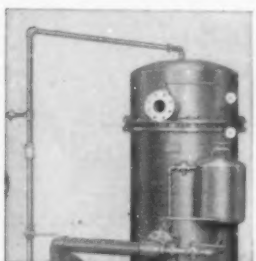
Beautiful Silver Thatch Inn, on Pompano Beach, Florida, offers its guests this lovely pool with underwater picture windows.

YES, here's another distinctive pool with the popular Adams Poro-Stone filters. More and more public pools are insisting on Adams Filters, and there are many good reasons why. Here are two of the important ones.

First, the exclusive ADAMS HI-FLOW backwash design gives you simple and easy cleaning . . . no messy disassembly . . . no scrubbing of filter elements. The high air dome and unrestricted backwash outlet provide complete purging of the filter tubes with high velocity water.

Second, rugged 4¼" O.D. PORO-STONE elements with nearly 40% open area are unaffected by corrosion. The first Adams swimming pool filter — in use since 1938 — was the first Poro-Stone Swimming Pool Filter installed in this country.

There are numerous other reasons why it pays to specify and buy Adams SPF filters. Get all the facts by writing for your copy of Bulletin 625. Use the Handy coupon below.



R. P. ADAMS CO., INC.

228 East Park Drive
Buffalo 17, N. Y.

This Adams SPF-129 Poro-Stone Filter keeps the Silver Thatch Inn pool water brilliantly polished for the enjoyment of swimmers and viewers alike. It offers 129 square feet of filter area . . . will handle pool's up to 185,000 gallons capacity. It is ideally suited for outdoor pools such as is shown above.

R. P. ADAMS COMPANY, INC. N-56
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Please send me by return mail your new Bulletin 625.

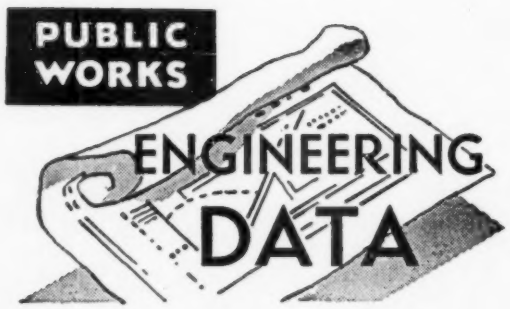
Name..... Title.....

Business.....

Street.....

City..... State.....

Size of pool is..... gallons.



Old Break Accounts for Unaccounted-For Water

During the winter of 1955 and the spring of 1956 the water demand of Pinconning, Mich., was so great that it was necessary to operate the filtration plant at capacity to meet the demand, something which had never been necessary before during the winter season. Every available device and method known to determine leaks was employed without finding the trouble. River crossings, drains, and sewer manholes were inspected, and pressure tests were made throughout the city. Portions of the distribution system were finally isolated, and the excessive-use district located, but leak detectors used in this area failed to turn up the point of trouble.

In May, "The Case of the Unaccounted-for Water" was solved. A water employee, while making a water shutoff, discovered a break in an old 4-in. main. Water was flowing into an 18-in. storm sewer by way of a buried catch basin. Many years ago, the catch basin had been covered with planks and the street grade raised. The presence of the catch basin was forgotten when the street was paved in 1926. At the time the leak was discovered, a cavity of 16 ft. in diameter was found underneath the pavement. Thus, a near catastrophe was averted before the concrete pavement failed and the citizens of Pinconning now have an adequate supply of water.

This interesting event was reported in a recent issue of the Michigan Water Works News.

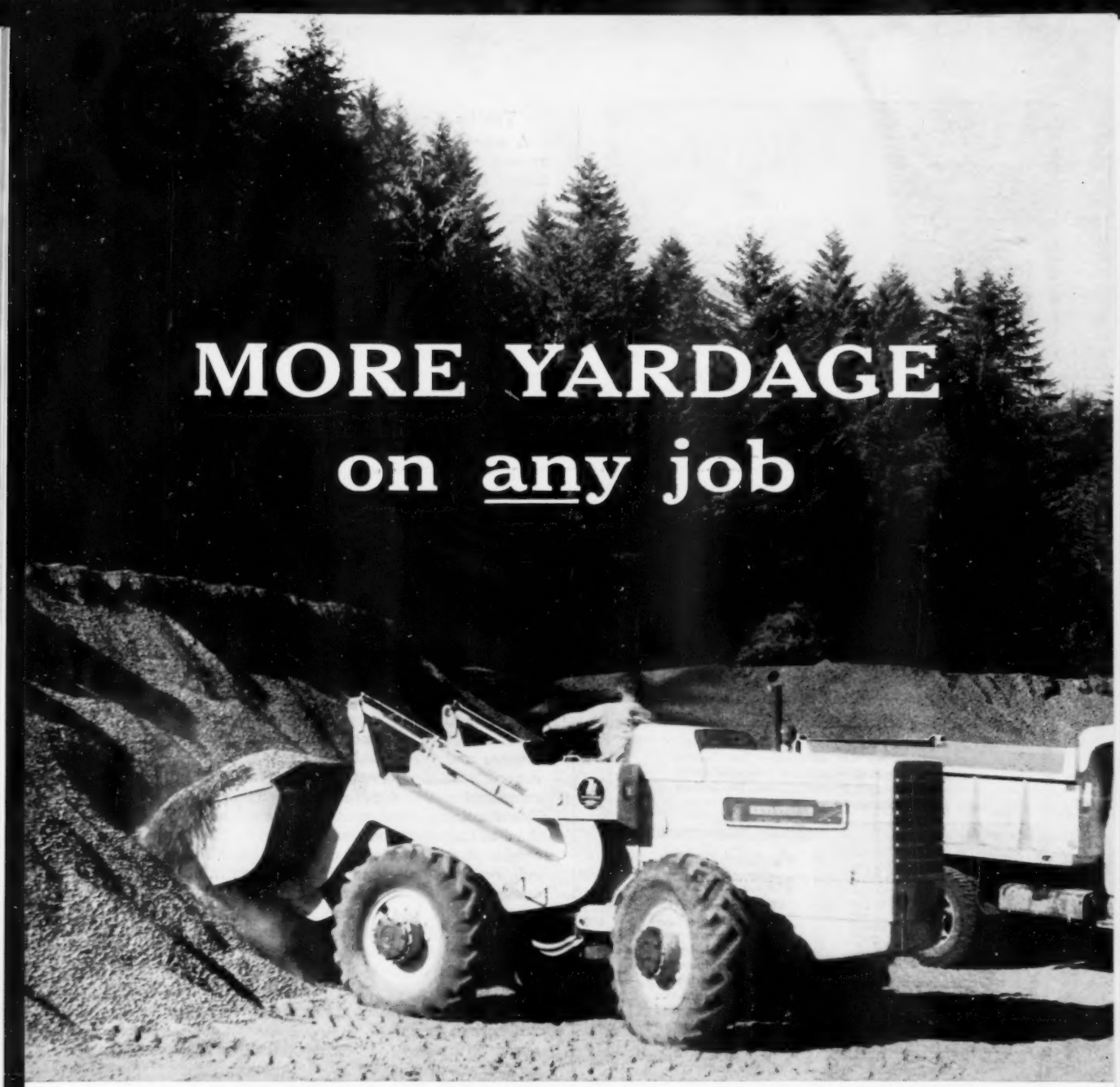
Allocation of Highway Funds

The State Highway Commission of North Carolina has allocated $6,219,336.82 in cash aid to 400 incorporated, active, eligible and qualified municipalities for improvements on non-highway system streets. The fund comes from a ½c per gallon of the total or gross 6c gasoline tax (less refunds) during fiscal 1955-56, when the gross State gasoline tax totalled $74,690,855.92. Half of the total allocation, or $3,109,668.41, is divided among all qualified municipalities on the basis of population. The per capita rate is $2.04 this year. Last year, it was $1.88.

The other half of the total allocation is divided among the qualified municipalities on the basis of relative mileage of non-State system or local streets which comply with the appropriate act. The mileage rate this year is $496.66. Last year, it was $472.65.

Trees Beautify a City

There are 12,054 parkway trees growing in Oak Park, Ill., as stated in that City's 1955 Annual Report. These include 9,998 American elms; the rest being soft and hard maples, box elders, catalpas, ash, sycamore, poplar, Chinese elm, linden, basswood, mulberry, oak and ailanthus.



more yards per load . . . more loads per hour

DIG MORE Powerful pry-out action and 40° bucket tip-back at ground level get full bucket loads with less spillage loss. Power-transfer differentials provide sure-footed traction for digging power.

CARRY MORE Bucket carry position is close and low for maximum stability. Hydraulic system shock absorber cushions loaded bucket—smooths the ride—permits higher carrying speeds with less spillage.

DELIVER MORE Since you get MORE to begin with and keep MORE while traveling at higher speeds . . . with less spillage in both instances . . . the result—you deliver more yards per load and more loads per hour.

Now you have a choice of three sizes of 4-wheel-drive "PAYLOADER" tractor-shovels, each with *all* the more-productive features pioneered and proven by The Frank G. Hough Co.

They have power-transfer differentials—an exclusive "PAYLOADER" tractor-shovel feature that maintains effective traction on mud, gravel, ice and snow.

They have "no-stop" power-shift transmissions and torque converters . . . planetary final drives . . . power-steering and 4-wheel power brakes.

They have the exclusive bucket motion with 40° bucket tip-back at ground level and powerful pry-out action.

For proof of their superior performance and greater productive capacity on *your* job, ask your "PAYLOADER" distributor for a demonstration.

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Send full data on 4-wheel-drive "PAYLOADER" tractor-shovels.

- ☐ model HO 2¼ yd. payload; 1¾ yd. struck
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- ☐ model HU 1½ yd. payload; 1 yd. struck

NAME

TITLE

COMPANY

STREET

CITY

STATE

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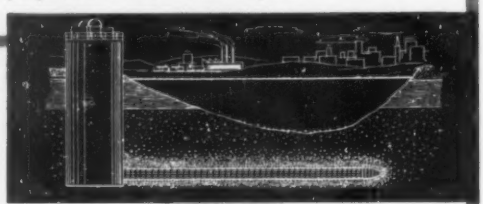
the CONVENTIONAL *Ranney Collector*

Proven by countless installations around the world, the collector yields naturally filtered water with less equipment, less personnel, and fewer pumps than other conventional systems.



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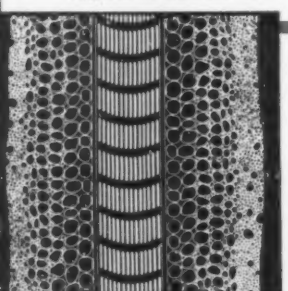
Engineered by Ranney to provide low cost water supply to industry and community. The Gallery provides large quantities of clear non-turbid water in a revolutionary yet economical way. The Gallery requires no maintenance.



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Developed exclusively for low volume users. It provides a natural gravel vertical water well at low cost. The Ranney Vertube is engineered with the same precision and efficiency as its two bigger brothers.

- Ranney provides naturally filtered water at low cost
- a water program for every community and industry
- Ranney engineering research provides the latest modern water supply techniques.

AMONG THE MANY RANNEY USERS ARE: Industries: Granite City Steel Co., U. S. Steel Corp., Eli Lilly and Co., Shell Oil Co., Monsanto Chemical Co., E. I. duPont de Nemours and Co., Timken Roller Bearing Co. Cities: Boise, Idaho, Canton, O., Parkersburg, W. Va., Manitowoc, Wis. Write to Dept. PW-5.

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Water Supply Engineers and Contractors
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Associate: Ranney Method Western Corporation

Traffic Control for Emergency Vehicles

A new radio controlled emergency traffic control system which has been developed by the Eagle Signal Corporation, should provide added safety to motorists, pedestrians and emergency vehicle personnel. The new system automatically controls the traffic signal lights at the intersection ahead of an approaching emergency vehicle and provides safe passage for these speeding vehicles. The system consists of three parts; a transmitter, a receiver, and a pre-emptor. A transmitter is mounted on each emergency vehicle and a radio receiver is usually mounted on one of the signal heads at each intersection. One receiver is required for each direction of approaching traffic. The pre-emptor, which actually operates the emergency condition of the traffic signals, is installed at the controller for each intersection. In addition to this control equipment, an interrogation light is installed, (one for each direction of approaching traffic) on or near the existing traffic signals.

Incidence of Water-borne Amebiasis

A study, following a small outbreak of amebic dysentery, tends to minimize the importance, in a good home environment, of intrafamilial transmission of the disease and of infection in food-handlers. The findings suggest that water-borne infection may be more frequent than is suspected.

Following the outbreak in a factory, resulting from contamination of a water supply by sewage in South Bend, Ind., the incidence of infection among the employees and their family contacts was investigated. Among 1542 employees, 52.4 percent were infected, compared with 4.4 percent in a neighboring plant. Examination of stool specimens from families of one-third of the employees involved determination of the combined amebic prevalence rate of *E. histolytica, E. coli, or Endolimax nana*. Any person infected with one or more of these was counted as a single positive, as an index of transmission.

No helminth infections were found, but 25.2 percent harbored one or more intestinal protozoa, 3.7 percent being infected with *E. histolytica*. Higher rates, though not significantly so, were found among the contacts of positive employees in rural compared with urban areas; and in families with privies compared with those having flush latrines. There was no difference in infection rate between persons who were served by infected food-handlers and those who were not.

—Abstracted from an article by M. M. Brooke in the AMERICAN JOURNAL OF HYGIENE. *62:214-226.*

35 Years of Highway Construction In Minnesota

Minnesota's 11,800-mile trunk highway system represents a total expenditure of $652,711,462 of state funds for construction purposes alone since the start of the Highway department in 1921. The total covers actual construction, engineering, right-of-way, planning and surveys and miscellaneous construction charges. It does not include highway maintenance operations or other fixed charges of the department. Four-fifths of the revenues to provide this total came about equally from the state motor vehicle and gasoline taxes and the remaining one-fifth from Federal aid.

Back-Up Alarm Signals for Greater Safety

ROBERT D. GIDEL
Bureau of Labor Standards, U. S. Department of Labor
in "Safety Standards"

Back-up accidents on construction jobs, and in loading and unloading operations, are a constant source of concern to safety engineers and employees. In the noise and commotion surrounding such activities, a man may not become aware of a backing vehicle until it is too late. Drivers do not always have perfect visibility when backing into various loading and unloading spots and must use all possible measures to prevent running over someone who may be otherwise preoccupied.

To cope with such problems, several systems have been developed to provide means of control. These are alarm signals which operate automatically while a vehicle is moving in reverse direction. They give an easily recognized audible or visual warning, or both, by using a horn, buzzer, gong, blinker light, or other means. They are available commercially or can be fabricated from kits of materials. In some cases, contractors working on Government jobs requiring back-up alarms will prefer to make up their own systems by obtaining the parts required from their local automotive parts supply house. These alarm systems are adaptable to wheeled or tracked equipment.

For a back-up alarm signal to be effective in field work, it must pass certain tests. It must be rugged, tamper-proof, and free from excessive maintenance demands. The rougher the job, the more rugged the system must be to hold up. These factors must be considered when systems for a particular operator are devised.

There are at least eleven different types of reverse alarm signals used by various contractors in construction work under the supervision of the U. S. District Engineer, Corps of Engineers, Seattle, Washington District. For at least a 5-year period, this was the only district of the Corps of Engineers that made the use of these alarms mandatory, and which had no fatalities in that time from back-up accidents.

Flood Control Equipment For Hartford

One of the most important flood control projects in Connecticut involves the protection of the City of Hartford. When the Connecticut River rises so high as to prevent surface run-off to flow into the river by gravity, it becomes necessary to pump this excess water through the dikes and into the river. To provide for this, the modernization of the South Meadow Pumping Station was necessary.

In the South Meadow Pumping Station six Caterpillar Diesel D397 engines, purchased for the Flood Control Commission will be used. Four other similar diesels will be installed at the North Meadow Pumping Station. The ten units will drive seven existing Morris, mixed flow vertical pumps, rated at 36,000 GPM at 30-ft. head, and three DeLaval pumps of the same type and rating.

According to Charles Cooke, former Director of Public Works and present head of the Park and River Flood Commission, it is probable that some additional drainage facilities will be required. City Engineer Daniel Tassilo will supervise these and other pumping station installations.

Winter accidents so often compounded by lack of advance warning can be stopped with the new SAF-T-PAK emergency traffic control kit. It sets up in seconds. Flasher lights, reflective flags and warning signs demand attention of motorists approaching an accident scene.

Standing 46½" high when opened, the SAF-T-PAK folds up to full size from a sturdy, compact, suitcase size. It stands ruggedly because it was engineered to do a real, authoritative job of traffic control under all conditions. Folded down, it easily stores in rear seat or trunk of car.

In cities with one man patrol cars, SAF-T-PAK kits are extremely helpful in the critical moments just after an accident happens. Sign messages are interchangeable; we offer a large number of wording options to cover all emergency and special traffic problems.

So get ready for winter traffic; give your police force and the public, too, this extra assistance and protection. Write today for our new SAF-T-PAK brochure and name of nearest sales representative.

FOR YOUR STANDARD TRAFFIC AND STREET SIGNS... LYLE, TOO

LYLE traffic and street signs are *"up-to-the-minute"* in design and proved materials which conform to latest U.S. Standards. Completely modern sign manufacturing methods guarantee unusual longevity and full-time service for your community.

Our 40-page Sign Catalog B-55 is yours on request.

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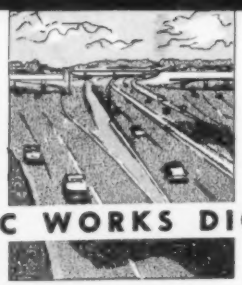


PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Asphalt Resurfacing In New Hampshire

The New Hampshire Highway Dept. employs two principal methods of resurfacing old roads—the "grader seal" and "brush sealing." The former uses a standard patrol grader, both to mix asphalt with the aggregates, and to spread them. Brush sealing uses steel drag brooms. The grader seal is gaining favor, particularly in refinishing roads that have been in use for more than five years; it gives a smoother pavement, but costs about $1200 per mile more than brush sealing. In both methods, 5/8-in. crushed stone is used, pretreated with MC-0 asphalt containing an anti-stripping agent, about 1.25 to 1.50 gal. of asphalt per ton of stone. Before placing this, the road is sprayed with MC-3 asphalt. Stone then is placed to attain a coverage of 45 to 55 lb. per sq. yd., and onto this is distributed more MC-3. The grader at once blades the aggregate from side to side until it is thoroughly mixed, and on this spreads the coated stone, which is rolled with steel rollers, and then covered with 3/8-in. untreated stone, about 7.9 to 15 lb. per sq. yd. For brush sealing, the road is sprayed with RC-4 asphalt and pre-treated stone is applied at the rate of only 25 lb. per sq. yd. and evened with a steel brush drag, given a fog coat of RC-4 and rolled; then covered with untreated stone and rolled. In each method, the entire process is continuous. Traffic flow is continued by use of pilot trucks which lead vehicles over completed sections.

"Continuous Operation Secret of Speedy Resurfacing." *Engineering News-Record*, Aug. 30.

Airblast Seeding And Fertilizing

About ten years ago New York State began the practice of hydraulic distribution of seed and fertilizer on roadsides. This reduced the cost to 1/3 and even 1/6 that of hand distribution. Later the distribution of granulated fertilizer by air blast has become rather common and further reduced the cost by 50%. It is now possible to distribute seed also by this method, using pelleted seed, the pelleting permitting the seed to be air distributed for a distance of 100 ft. However the cost of pelleted seed is quite high. It is possible that an adaptation of mist blowers may permit the distribution of unpelleted seed. The use of water and air as propellents has proven satisfactory when practiced by adapting such equipment as orchard spray rigs and sand blast machines.

"The Air Age Comes to Seeding and Fertilizing." By E. W. Muller, Jr., of N. Y. Dept of Pub. Wks. PUBLIC WORKS, October.

Route Markers For Interstate Roads

Believing that the interstate highway system will require a new type of signing and new and different type of route markers to keep unfamiliar drivers properly informed, the author proposes the one illustrated here. The shape is that of an I, indicating "interstate." It contains red and blue diagonal stripes. The shape, color and design all being distinctive, these markers can instantly be recognized as different from any state or federal marker. The numerals to designate the route number are easily read without slackening speed under normal driving conditions.

Courtesy Better Roads

● Suggested interstate road marker is I-shaped with the numeral and state white against a field of red and blue.

"A Distinctive Route-Marking System for Interstate Roads." By Robert A. Burch, Traffic Eng., N. C. State Highway Commission. *Better Roads*, September.

Open-Graded Surfacing in California

Open-graded plant-mixed surfacing as used on California highways is defined as a bituminous mixture in which the grading of the mineral aggregate is deliberately left open so that the voids of the coarse aggregate are unfilled by finer aggregates. A relatively higher asphalt content provides thicker asphalt films which bind the mixture together when maximum mineral aggregate surface contact is made. Only 30 to 50% of the aggregate used passes the No. 4 sieve. The bituminous binder used is between 3½ and 5% of the dry mineral aggregate. This surfacing is placed as a blanket 0.05 to 0.10 foot thick on a dense graded asphalt surface, previously tacked with a fog spray of asphaltic emulsion. An important advantage of this open-graded surface is its improvement to the riding quality of the pavement. It provides a smoothness which gives an easier riding surface and reduces impact loading, and the loud noise caused by tires operating on a rough surface is greatly reduced. It is relatively dry during wet weather. It heals over any failure cracks which may occur in the dense graded pavement underneath. A disadvantage is that the expansive force of ice exerted against the coarse aggregate combined with the cutting force of tire chains erodes the coarse aggregate out of the mat, as also do the treads and blades of road cleaning equipment. Also it is difficult to

CAMDEN—Pierce Ave., at E. State St., was built in '28. Photos taken in '28 and '54.

HERE TODAY *and still here tomorrow*

that's the story of New Jersey's CONCRETE STREETS

When our cameraman photographed the same concrete streets in New Jersey that had been recorded a generation ago, his new pictures became irrefutable evidence of concrete's durability and economy.

Durability and low-annual-cost service are typical of concrete pavements. Due to advances in engineering design, materials and construction methods, concrete pavements today can be built to last at least 50 years.

Concrete streets are safest, too. Their gritty, skid-resistant surface permits quick stops—wet or dry. At night, their light color gives maximum visibility. *You're safer when you can see. You can see better on concrete!*

For more information about designing durable, safe, ***low-annual-cost*** concrete streets, write for free literature, distributed only in the United States and Canada.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of portland cement and concrete...through scientific research and engineering field work

Dept. 11-89, 33 West Grand Avenue, Chicago 10, Illinois

BOGOTA—Palisade Ave. was paved in 1922. Photos taken in 1927 and 1954.

COLLINGSWOOD—Park Ave., at Dill Ave., was paved in 1921. These photos were taken in 1922 and 1954.

Leelanau County's rubber-tired fleet speeds roadbuilding for resort area

D Tournapull makes "U" turns easily in 2nd gear, without having to stop and back-up on narrow county roads. Rig turns within 26' . . . less than its 28' overall length.

Heavy rains in Leelanau County, Michigan, often damage roads, make travel dangerous. At times, high waters have washed out entire road-sections, bridges, and railroad embankments. Fast-working road maintenance equipment is a necessity. Leelanau County solves this problem . . . and provides equipment for construction and maintenance . . . by using two 29.5 mph D Tournapulls and one high-speed 208 hp Tournatractor.

"Higher mobility, higher production"

According to County Superintendent William Herman, high-speed, rubber-tired D Tournapulls and Tournatractor prove "an ideal combination for county-type maintenance along blacktopped or gravel roads". He says, "Tournatractor and D Tournapulls give us higher mobility, higher production, and lower costs."

Tournatractor dozes material in a nearby gravel-pit. Rig also works as pusher, handles dozing and clean-up, removes trees and stumps on right-of-way work.

"D's" load hardpan in 1 min.

While making emergency road repairs after wash-outs is an important part of their job, these rubber-tired machines handle routine road construction and maintenance as a primary assignment. Over 600 miles of roads are kept smooth and well drained. One recent project (illustrated), was at Sutton's Bay, where Tournapulls and Tournatractor elevated a section of the road to: (1) improve surface, (2) eliminate snow "traps", (3) prepare road for eventual blacktopping.

Here D Tournapulls work in dust, cut drainage ditches along both sides of the road. Large boulders made loading tough, but rigs self-loaded the dead material in about a minute, over a 155' distance. They hauled hardpan out of the ditch, and spread it on right-of-way. "D's" completed 2563' round trip in 4 minutes, 24 seconds.

Stretch county budget dollars

Superintendent Herman believes the high-speed, drive-anywhere advantages of his rubber-tired earthmoving fleet stretch county budget dollars. Why not check Tournapull and Tournatractor advantages in speed and mobility against the equipment *your* county may now be using?

Tournatractor, Tournapull—Trademark Reg. U.S. Pat. Off. DPT-946-P-2

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

patch. It costs about 15 cts per sq. yd., as compared to 11 cts for chip seal. The article gives details of construction as developed by past experience.

"Report on Open-Graded Plant-Mixed Surfacing." By W. C. Carroll, Ass't Eng. *California Highways and Public Works*, July-August.

Abrasives for Snow and Ice Control in Ohio

Snow and ice control on the Ohio Turnpike during the winter of 1955-56 depended basically on the use of abrasives, with light chemical treatment in deference to the new concrete. In addition to providing traction, dark-colored abrasives define traffic lanes during snow storms and at night. Calcium chloride is used to keep stockpiles of abrasives unfrozen and serve also as a melting agent. Sodium chloride functions most effectively at lower temperatures in combination with calcium chloride. The Commission expects to use 33,000 tons of abrasives, 3,850 tons of calcium chloride and 6,600 tons of sodium chloride during the coming winter. Last winter it experimented with a chemical which combines these two chlorides in the same pellet in proportions of 25% calcium and 75% sodium. On one occasion, with snow falling continuously for about 15 hours, one heavy application of this chemical followed by plowing and treatment with a chemical abrasive mixture, kept the turnpike entirely free of ice or packed snow throughout the period. The snow was easily plowed and the pavement was clear and dry within an hour after the end of the storm.

"Winter on the Ohio Turnpike." By James D. Hartshorne, of the Turnpike Commission. *Public Works*, October.

Survey of State Highway Department Use of Chemicals

From a survey of practices among state highway departments, statistics have been gathered on the use of herbicides, traffic paint, glass beads, de-icing chemicals, antistripping additives and soil stabilizing chemicals. The key physical properties of traffic paint are drying time, durability and bead adherence. Titanium dioxide and lead chromate are the prime pigments, and alkyd resin type vehicles are used. Nearly 4 million gallons of paint were used in 1955 by the various departments. To increase visibility, glass beads were incorporated in most road stripes, to the

extent of 8,800 tons last year. De-icing compounds are principally calcium and sodium chlorides, with sodium chromate as a corrosion inhibitor sometimes used. Last year's usage of de-icing compounds by 43 states was more than 688,000 tons. Herbicides most commonly employed are 2, 4-D and 2,4 5-T and some states have tried maleic hydrazide to inhibit grass growth. The total quantity of herbicides used in 1955 by 31 states was 440,-554 gallons. Antistripping additives to permit the coating of wet aggregate with asphalt and to increase the water resistance of the asphalt-rock bond were used primarily in eleven states. Rubber is used with asphalt in some areas to provide resistance to fracture and to provide elasticity and stability. Silicones are employed as curing agents for concrete to prevent moisture damage. Calcium chloride is generally accepted for soil compaction, although some work has been done on using calcium polyacrylate.

"Chemicals for the Road." By Fred Burggraf, Director, Highway Research Board. *Industrial and Engineering Chemistry*, September.

Changing Railways Into Highways

An English author suggests obtaining right-of-way for much-needed additional highways by abandoning the railways and using their right-of-way for this purpose. Using figures for the freight and passenger traffic carried by the railroads in 1955, he calculates that double this amount could be carried by 6,450 buses and 20,320 trucks. Estimating the cost of maintaining and operating the motor vehicles and the railroad vehicles, he figures the former at £102,000,000 a year and the latter at £438,000,000. The upkeep of the highway he estimates to be about a tenth of that of the railway roadbed.

"Railways Into Roads?" By T. I. Lloyd. *Contractors Record*, September 12.

Low Cost of Florida's Turnpike

Florida's Sunshine State Parkway is being constructed at a much lower cost per mile than any other turnpike in the country, it is claimed —about $470,000. One of the reasons for this was the letting of the work by small contracts. Grading, drainage and fencing was let in sections ranging from 6 to 10 miles. This permitted many small contractors to bid on sections handy for their equipment. Also, in a year of con-

Build, repair, maintain more roads at low cost

Up to 25% more push power

behind this blade

By itself, the rated horsepower of a grader doesn't mean a thing. It's the *usable power at the blade* that counts.

How *much* available engine-power you actually put to work depends on your grader's gear-train. With your gear-shift, you proportion driving force between *push* and *speed*. Working in too low a gear-ratio wastes power that could be used to move the load faster. Too high a gear-ratio leaves operator the choice of taking a very light cut . . . or of overloading, and pulling down his engine to inefficient operation at close to stalling speeds.

Up to 33% more forward speeds

That's the reason Adams gives you a full range of 8 forward speeds — more than most other graders. Operator has more freedom to work at *fastest practical speed* for any load condition . . . can complete jobs 10 to 25% faster than comparable competitive graders.

Fast on shuttle work

In reverse gear, Adams gives you a range of 4 back-up speeds (instead of 2 in other graders) with a top of 13 mph. That means faster shuttle work — important today because of high man-hour and machine-hour cost.

Higher-than-average travel speeds — up to 26 mph — save you additional time on job-to-job travel with Adams.

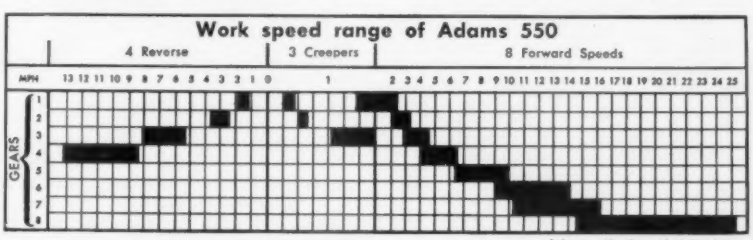
Extra lugging power when needed

Adams has an even wider gear-range available for extremely hard or tough materials. Optional creeper gears apply *full* horsepower at speeds down to 32 ft. per min. with accompanying increase in tractive effort. With these 3 additional speeds (total 11 forward), you get extra power . . . save wear and stress on grader . . . and have far more accurate control for finish-grading.

Let us give you details on how this all adds up to more work capacity per engine horsepower. Adams graders are available in five models, rated 60 to 150 horsepower. Write us for comparative data on best size for you.

60 hp Model 220 is a top-quality, low-cost grader, with more limited range of gear-ratios than heavier-duty models as described above.

Wide speed selection lets Adams graders work any load at fastest practical speed. That means more work done in a day's time, more power for working in tough materials.



Adams—Trademark AG-18-P-z

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

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struction there was not a single day when all construction had to be halted because of the weather. The large number of contractors expedited the construction and hastened the day when the road could be used and begin earning the anticipated $15,500 daily. Contracts for roadbed and base course were let in sections of 10 to 14 miles, and the surfacing in 10 to 20-mile sections. The 87 bridges were let in contracts of 3 to 5 bridges each.

"Biggest Per-Mile Turnpike Bargain in the United States." By Thomas E. Manuel, Chairman, State Turnpike Authority. *Better Roads,* September.

Systematic Study of Highway Accidents

The Engineers' Guild of the Association for Chartered Civil, Mechanical and Electrical Engineers of Great Britain has urged the Ministry of Transport to adopt a scheme for making a systematic investigation of highway accidents. Reports on accidents are generally made by police, who are not acquainted with engineering possibilities for avoiding accidents; because of this, the cause of an accident is often reported as due to the driver, when it might have been prevented by better design or maintenance. They recommend that an engineer be employed by each highway authority, from the local up, who would be concerned solely with accidents. He would send his report on each accident to a central authority, where all reports would be studied by an engineer, and published for public distribution.

"Road Safety: A Proposal for a Systematic Accident Investigation." *Contractors Record,* Aug. 15.

Overhead Traffic Signs in Michigan

A notable recent advance in traffic signs is the overhead sign hung from rigid supports on multi-lane expressways. In Michigan the letters are made 15 to 24 in. high. The fixed span from which the sign is suspended permits maintenance access. A green arrow, an amber cross and a variable speed control indicator are mounted over each lane. They are illuminated from within with neon high-intensity tubes. A catwalk gives access for servicing. The department is interested in radio control from a central station of signals over an entire metropolitan area; and in television monitoring of expressway traffic. A problem in connection with overhead signs is illumination; since head-light beams cannot be directed high enough to reach the sign, reflectorization is useless and the signs must be illuminated in some other way. Under a recent Michigan law, all traffic signals must be installed overhead, at or near the center of the street, road or intersection, facing in each direction of traffic movement. This law goes into effect Jan. 1, 1958. An experimental installation of overhead signs includes posts on opposite corners connected with an aluminum tube span from which the signal heads are hung; power wires being run through the posts and tube to the signals.

"Basic Developments in Traffic Control Devices." By J. Carl McMonagle, of Michigan State Highway Dept. PUBLIC WORKS, October.

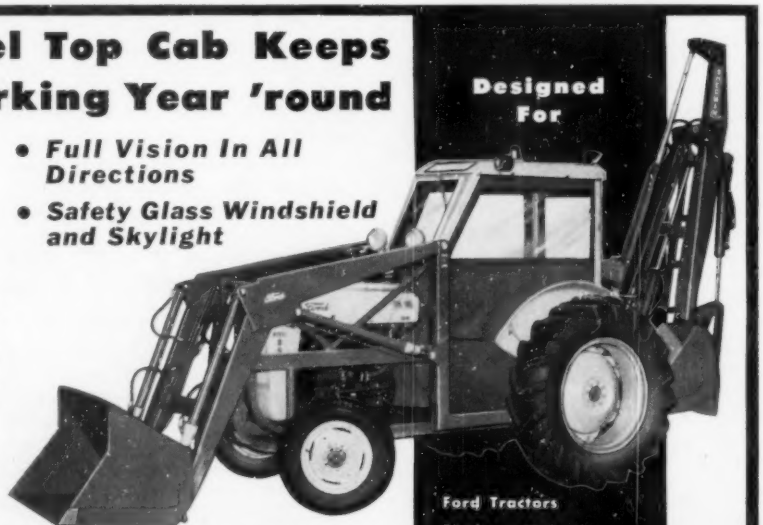
Other Articles

"Highway Estimating Methods: Small Tools and Supplies." Gives a check list of more than 1,000 items used in highway construction. By Geo. E. Deatherage. Roads and Streets, September.

A *Northeast* Steel Top Cab Keeps Your Tractor Working Year 'round

- ***Operating Controls Inside***
- ***Roll-up or Snap-off Curtains***
- ***Full Vision In All Directions***
- ***Safety Glass Windshield and Skylight***

Don't let bad weather shut down your jobs . . . a Northeast Cab assures operator comfort Winter or Summer...keeps your tractor earning every day, every season. Cabs are custom built for each tractor model to fit snugly and provide maximum protection from cold, wind, rain and snow. Heavy gauge steel top and supports with heavy-duty water resistant canvas side and rear curtains. Safety glass windshield and skylight mounted in rubber and aluminum frames . . . side windows of heavy gauge, crystal clear Vinyl plastic. Windshield wiper is standard. Cabs are packed in kit form, complete in every detail...no hidden extras to buy . . . easily and quickly installed. Write direct for details and prices, indicating tractor you own, or see your tractor dealer today.



Universal Mounting

Each cab is designed to fit the tractor itself and the most popular makes of front end loaders, back-hoes or any combination of front and rear mounted equipment you now own or may add later. One Northeast cab enables you to use all your equipment.

Designed For

Ford Tractors
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and the Allied Equipment — Front and Rear Mounted

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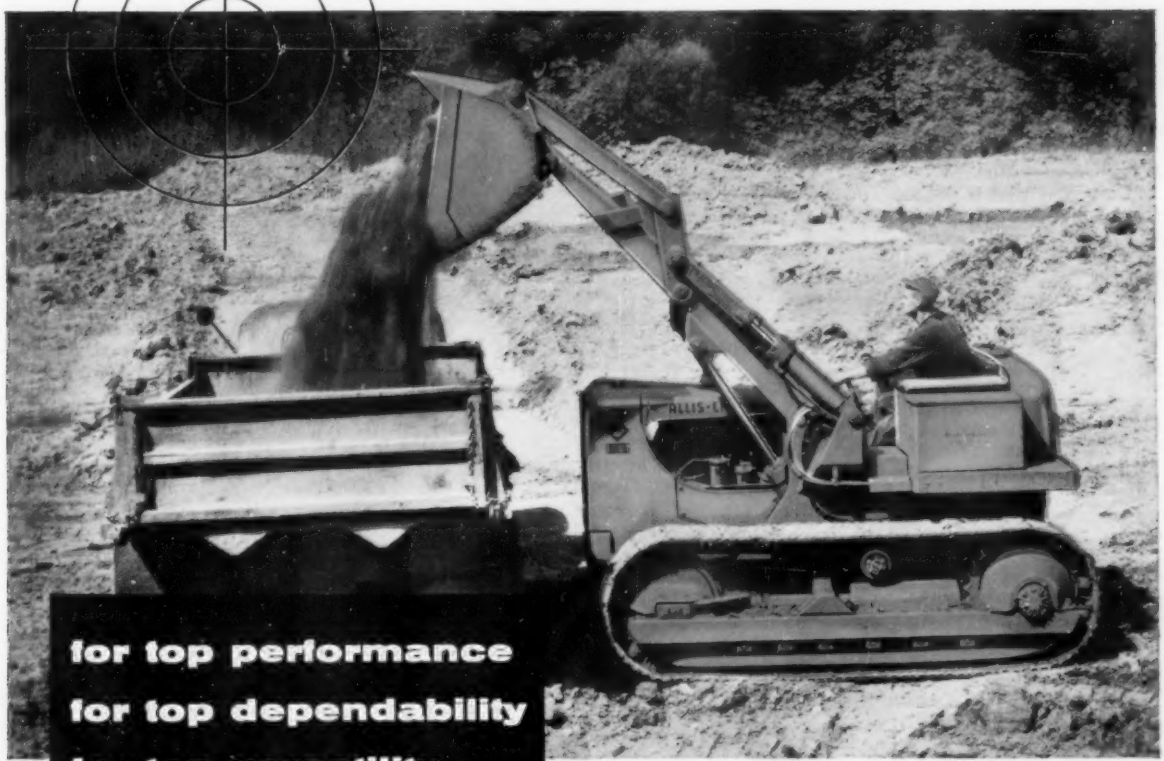
Set your sights on an HD-6G



for top performance
for top dependability
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1½ yd bucket **68.5 belt hp** **19,600 lb**

and all these exclusive on-the-job advantages important to both owners and operators . . .

Allis-Chalmers long-life diesel engine — power that handles tractor and bucket demands with ease.

Heavy welded-steel shovel side frames and low stabilizer — provide greater strength, low center of gravity, outstanding visibility.

Full-flow filtering — filters oil three ways, provides long-life protection for hydraulic system.

Six truck-wheel stability — almost 7 ft of track on the ground for superior balance.

1½-yd two-position bucket — handles big loads efficiently in loose material or hard-packed dirt.

All-steel, box-A main frame — soaks up shock loads, protects the entire power train.

One-piece steering clutch and final drive housing — line-bored for true alignment of shafts and gears.

Straddle-mounted final drives— with bearings on both sides of gears to maintain correct gear tooth alignment.

Simplified lubrication (including 1,000-hour lubrication intervals on truck wheels, idlers and support rollers) provides extra working time.

Unit construction—makes service easier, faster. Major units can be removed without disturbing adjacent assemblies.

Plus husky wrap-around radiator guard . . . simplified piping . . . heavy-duty truck frames . . . heavy-duty, roller-bearing truck wheels . . . matchless control . . . and the convenience of 24-volt direct electric starting.

Check the complete service program offered by your Allis-Chalmers construction machinery dealer. His factory-trained servicemen, factory-approved facilities, and stocks of True Original Parts keep your equipment operating properly . . . provide the kind of service that saves you money. See him soon; he'll be glad to show you an HD-6G at work.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

"Failures in **Concrete Kerbs;**" study of pre-formed curbs in England, by Road Research Laboratory. By F. N. Sparkes. The Surveyor, Aug. 18.

"**Yield Signs** for Rural Highways." By H. H. Harrison, Eng. of Traffic, Illinois Div. of Highways. Public Works, October.

"Impacts of the Accelerated **Highway Program.**" Ability of manufacturers and contractors to meet the demands. Public Works, October.

"The **Road Program**—Opportunity and Challenge." By Bernard F. Hillenbrand, of American Municipal Ass'n. Public Works, October.

"Nomograph for **Box Culvert Design.**" By George P. Fulton. Public Works, October.

"The Work of the Road Research Laboratory (British); **Safety and Traffic.**" Results of Investigations on braking, accidents, street lighting, skidding, traffic on rural roads, capacities of roundabouts (traffic circles), etc. Roads and Road Construction, August.

"Road Works in **Holland, Germany and Denmark.**" Roads and Road Construction, August.

"Crisis Tests **Organizational Efficiency** of Department" during floods in Siskiyou County. By Orel E. Lewis, County Road Com'r. Better Roads, September.

"**Limited Access** for Modern Roads." From a report of the Ohio Dept. of Highways. Better Roads, September.

"Highway-User **Tax Schedules** Recommended in State Highway Finance Studies." An Analysis by the Bureau of Public Roads of study findings in nine states. By G. P. St. Clair and Hugo C. Duzan, of the Bureau. Public Roads, October.

"United States-Canadian **Border Commercial Traffic.**" Result of Study made in 1954. By Daniel O'Flaherty, of the B.P.R. Public Roads, October.

"**Rock Methods** on the Connecticut Turnpike." Use of latest equipment and methods. By Harold J. McKeever, Editor. Roads and Streets, September.

"Line Your **Old Culverts** and Save Them," by lining them. By W. T. Adams of Armco Drainage & Metal Products, Inc. Roads and Streets, Sept.

"**Facilities for Motor-Vehicle Inspection,**" by N. J. Div. of Motor Vehicles. Public Works, October.

Contest Lists "Payloader"—Wain-Roy Backhoe Uses

IN AN interesting contest sponsored by the Wain-Roy Corporation, entrants were invited to list the greatest number of job applications for the Hough "Payloader" Wain-Roy Backhoe combination that they had used or could visualize. The contest was held during the 1956 Public Works Congress and Equipment Show at Fort Worth, Texas, and was open to all public works men in attendance.

Robert C. Garnier, Assistant City Personnel Director and Classification Examiner of Milwaukee, Wisconsin, won the $100 savings bond first prize for his list of some seventy job applications for water and sewer departments, street construction and maintenance, street lighting, street sanitation and park departments. Winner of the second prize, a $50 bond, is Willard S. Pratt, Director of Public Works, Newton, Massachusetts. Since two very fine entries were considered virtually tied for third place, duplicate $25 bond prizes will be awarded to Raymond E. Hadley, Superintendent of Public Works of LaGrange, Georgia, and Ed M. Stiles, Director of Public Works of Natchez, Mississippi.

A feature article in an early issue of PUBLIC WORKS will present a full report on the tremendous variety of effective job applications suggested by the contest entrants.

Low Cost—Big Yardage—Versatile ARPS Dozer

- Quick, Easy Installation
- Double-Acting Hydraulic Control
- Wide Range of Blade Positions
- Positive Down Pressure

Here's the low cost, rugged dozer attachment that can't be beat for removing top soil, leveling, grading, snow plowing, backfilling, landscaping and many other earthmoving applications. Blades supplied in 4', 5' and 6' lengths for every need. Dozens of exclusive features help you do a better job with low initial investment.

Handy ARPS Utility Blade

- Strong, Tubular Frame
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This handy unit will convert any 3-point hitch tractor to a versatile tool for ditching, terracing, grading, landscaping, backfilling, land leveling, road building and snow removal. Tilts up or down 35° — has five positions. Nine angular positions forward and three in reverse. Offsets to the right or left with eight blade pitch adjustments. Rotates full 360° — can be fully reversed for backfilling. Gauge wheel for precise finishing.

See your tractor dealer for the full story on Arps Dozers and Utility Blades, or write for literature and prices.

ARPS CORPORATION
NEW HOLSTEIN, WIS.

TRENCHERS • HALF-TRACKS
BULLDOZERS • UTILITY BLADES
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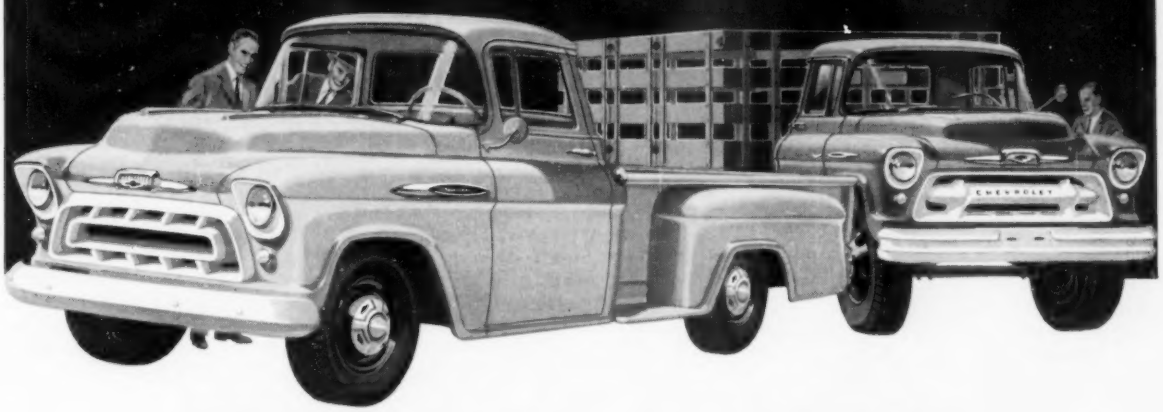
Here Now! NEW CHEVROLET TASK·FORCE 57 TRUCKS!



FIRST with the MOST modern features

They're out to save you hours and dollars on any hauling job... and they've got big new power plus the modern features that make it a sure thing! They put you way ahead with time- and work-saving advantages you won't find in any other truck!

Again, in 1957, Chevrolet light- and medium-duty trucks bring you the industry's most advanced features—new developments that have already been proved in a history-making preannouncement test run! (See below.)

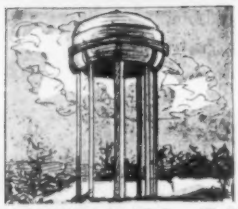
For '57 there's bold new styling to match Chevy's remarkable stamina and dependability. There's fleet-action power in Chevy's outstanding engine line-up for '57—with modern versions of the famous Thriftmaster and Jobmaster 6's, efficient short-stroke Trademaster V8's and sensational new 283-cu.-in. Taskmaster V8's!

Other way-ahead '57 features include advanced Ball-Gear steering, high-output 12-volt electrical system, modern tubeless tires and great optional (extra cost) features such as Hydra-Matic and Powermatic transmissions!

Be sure to check the new cab features, too . . . the handsome new upholstery, the new steering wheel, the new exterior colors. Your Chevy dealer has all the details, so see him soon! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Alcan Highway Test Run Proves Chevrolet Ruggedness!

In an AAA-certified endurance run, 6 light-, medium- and heavy-duty trucks carrying typical cargoes roared up the 1,520-mile Alcan Highway (normally a 72-hour run) in less than 45 hours! In dramatic fashion, new Chevy trucks conquered one of the world's most challenging roads to display the great performance qualities they'll bring to *your* roads!



PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Modernization of Philadelphia's Water Department

Some details of changes involved in transferring the water service of Philadelphia from a general governmental operation to a self-containing utility are described in this article. These included not only management problems and improved public relations, long-range financing, etc., but also metering and rate making. In the latter, they have followed basic principles established by the Penn. Public Utility Com'n for private water companies. Changes in the physical plant included substitution of rapid sand filtration for the three previous slow sand filters; also the installation of as much automatic control as possible.

"Philadelphia's Water Department Organized on Full Utility Basis." *Water Works Engineering*, September.

Colloidal Filters In a Small Village

The village of Copenhagen, N. Y., population about 700, has for years used as a public water supply a stream with excellent characteristics except that at times it carries a heavy load of silt. No treatment was given the water other than chlorination. At times there was an undesirably high color. Desiring to improve the quality, diatomite filtration was adopted in 1953 with a capacity of 250 gpm. Sedimentation was provided to remove the silt. With prechlorination and use of a coagulant, the filter plant removes color also. Filter runs have been as long as 12 to 14 days.

"Diatomite Filters Supplemented by Coagulation for Color Removal." By Arthur H. Emerson. *Water Works Engineering*, September.

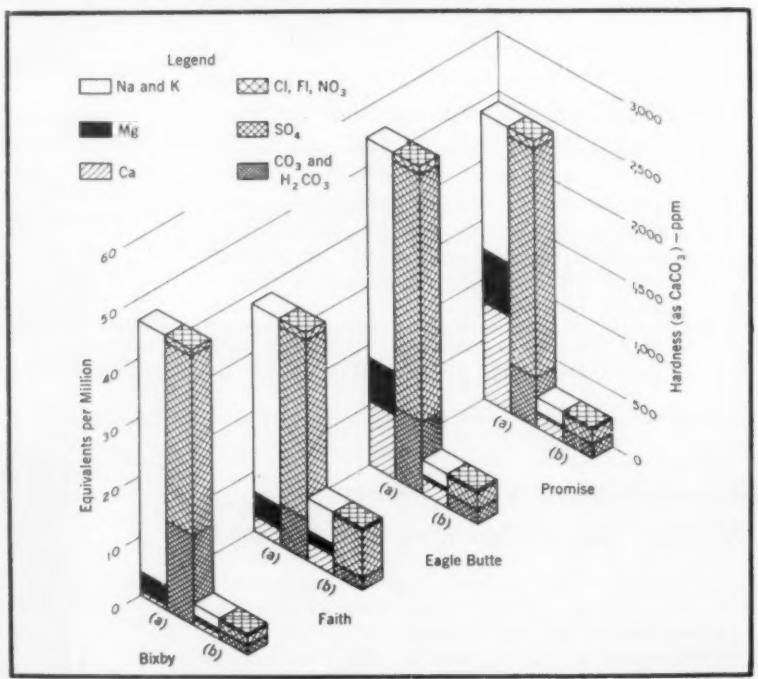
The Missouri River As a Source of Water Supply

In a panel discussion at the 1956 Conference of the AWW Ass'n, several engineers described the means being employed to control both the quantity and quality of the water available from the Missouri river to communities in its valley.

The quantity available is made more uniform throughout the year by the construction of reservoirs. More than 50 reservoirs have been constructed or are planned for construction in the upper basin. Further down are six main-stem reservoirs, of which 4 are nearing completion, with a combined capacity of 73,500,000 acre-feet. In the lower basin are a number of tributary reservoirs. This reservoir system is described in a paper by Wendell E. Johnson, Eng., of the U. S. Army Corps of Engineers.

The works for regulating the flow of the river may cause some changes in the chemical quality of the river water, but only minor ones. Samples taken at several points in Montana, North and South Dakota and Nebraska show dissolved solids ranging from 352 to 491 ppm, and hardness from 175 to 235 ppm. These data were given in a paper by George E. Ferguson, Eng. of Water Resources Div., U.S.G.S.

According to Dwight F. Metzler, Chf. Eng., Kansas State Bd. of Health, pollution of the river is increasing and will continue to increase until the needed waste treatment works are put into use, the cost of which is estimated to be $100,000,000. A study made in 1950-'51 by the U.S.P.H.S. revealed serious bacterial pollution and excessive organic pollution in some stream reaches. Sewage is contributed to the lower Missouri from 270 sewer systems, a total population of about 2,900,000, plus industrial wastes with a population equivalent 1,728,280, of which only 7.1% is treated. The reservoirs have greatly reduced turbidity, alkalinity and hardness down stream from them.

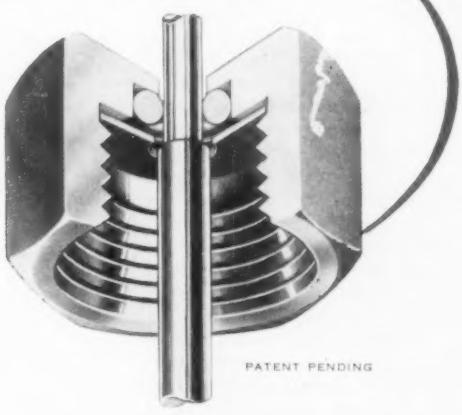


Courtesy Journal AWWA

● **Variation in concentration of minerals at four sampling points on the Moreau River, S. D. Conditions at minimum flow are designated (a); those at high flow (b).**

The Rockwell "O" -Ring Stuffing Box Assembly

ENLARGED DETAIL



PATENT PENDING

Stops Leaks, Binds, Troubles, Expense

The Greatest Single Advance In Water Meter Construction In Years

Here's another outstanding development from Rockwell Research. It's a sure cure for all the headaches that go with meter stuffing box maintenance. Perfected four years ago, this Rockwell "O"-Ring Stuffing Box assembly has now been thoroughly field tested. *It won't leak; can't bind!* Meters with this construction run more freely, stay accurate longer. Worn spindles are a thing of the past.

Now *all* Rockwell water meters make use of this *exclusive* "O"-Ring design upon which patent application has been made. There's no extra cost for this construction, but a lot of extra satisfaction and value. Ask your Rockwell representative to demonstrate. And be sure to inquire about the use of "O"-Ring stuffing box nuts as interchangeable replacements for stuffing box assemblies in earlier model Rockwell meters.

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ROCKWELL WATER METERS

A Size and Type For Every Kind of Service

ARCTIC | TROPIC | TYPE 12 | TYPE 14 | TYPE 16 | TYPE 6 | EUREKA B | DUAL UNIT COMPOUND

The effect of the improvements in the river at Omaha is described by John C. Detweiler, Gen. Supt., as regulation of the flow of the river, lower peak and average raw water turbidity, and a change in the taste and odor problem. At Kansas City, Mo., according to James B. Ramsey, turbidity has been reduced 50 to 75%; coliform counts have been greatly reduced.

The Missouri River—Panel Discussion." *Jour. of AWW Ass'n*, August.

Trends in Treatment Plant Design

The author sums up recent changes in theories and construction and operation details, and probable future developments. He cites the use of surface loading rather than detention time as a criterion for designing sedimentation basins, and use of mechanical sludge removal equipment. Also he indicates the place of suspended solids contact clarifiers in water treatment; when high filtration rates are desirable; the size of filter units, and use in them of butterfly valves; the use of the new polystyrene base resins in ion exchange. Development is needed in methods of making water non-corrosive and free of tastes and odors.

"Water Treatment Plant Design: Where Is It Headed?" By William W. Aultman. *Water Works Engineering*, September.

Detection of Coliform Bacteria By New Methods of Analysis

Two new methods have come into use which make it possible to obtain reliable results in coliform detection within an 18-hr. period—membrane filter technique, and use of the electron microscope. Studies have been conducted at the Chicago South District filtration plant to investigate the possibility of combining the two methods into a single procedure which would render reliable results the same day the sample is taken. The studies involve determination of the minimum number of coliform cells necessary for electron microscope examination. It was indicated that a 6-hr. incubation period was adequate for a minimum population of 2,000 or more cells, but not for 800 or less. A 7-hr. incubation period was adequate for 800 to 200 cells but not for 80 or less; and an 8-hr. period was adequate for approximately 70 cells. These results were obtained by procedures described in the paper, which include the use of a special acceleration medium. The results obtained were qualitative and quantitative.

"Studies in the Detection of Coliform Bacteria Combining the Techniques of the Electron Microscope and Membrane Filter Methods of Analysis." By L. E. Scarce. *Pure Water*, July.

Basic Chemistry for Water and Sewage Works Operators

Chemistry involves relationships of atoms, molecules, elements and compounds. The relative weights of the elements determine the proportion with which elements of the same valence combine. Valence is the ratio of the capacity of an element to displace or combine with hydrogen and may be positive or negative depending on whether hydrogen is repelled or attracted. Compounds are combinations of elements or atoms, and as found dissolved in water or sewage are separated into elements and radicals, known as positive or negative ions or cations and anions, respectively.

An understanding of chemistry requires knowledge of the metric

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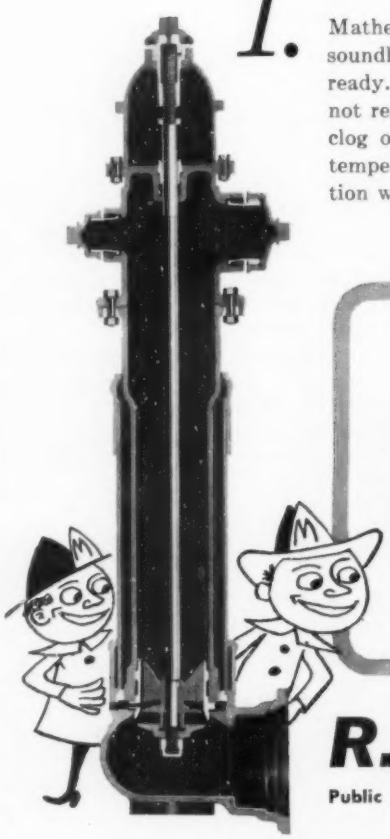
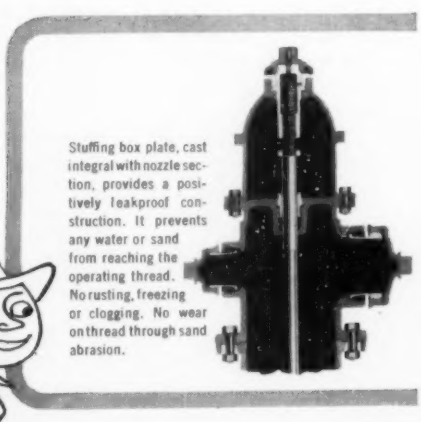
Mathews Hydrants are so simply and soundly constructed that they are always ready. Water, ice and sandy deposits cannot reach key parts to rust or freeze, or clog operation. In any weather and all temperatures, Mathews Hydrants function with a minimum of maintenance.





Stuffing box plate, cast integral with nozzle section, provides a positively leakproof construction. It prevents any water or sand from reaching the operating thread. No rusting, freezing or clogging. No wear on thread through sand abrasion.

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system of volume and weight measurement, temperature scale, relationships and density and specific gravity measurement. The presence and relative concentrations of acids and alkalies in water and sewage are important in controlling treatment processes. The intensity of acidity or alkalinity is indicated by "pH." Standard solutions are used in analytical work and are solutions of definite concentrations of a particular substance. A normal solution contains one gram-equivalent weight (based on reacting value) of a substance in one liter. A one molar solution contains one gram-molecular weight of a substance in a liter of water. Gravimetric analyses are made on the basis of weight relationships between compounds; volumetric analyses involve volume-normality relationships; and colorimetric tests compare colors developed in solutions of known concentrations with that of an unknown concentration. Tests commonly used routinely in water treatment are alkalinity, salinity, and hardness. Softening of water, accomplished by adding lime and soda ash or by ion exchange treatment, is controlled by tests for hardness, alkalinity, pH, and carbon dioxide. The alkalinity test is of importance in determining quantities of coagulants required in treating surface water and in judging its stability. Iron and manganese removal is generally accomplished by oxidation through aeration or chlorination. Calgon is useful in sequestering ions to prevent their precipitation in mains. In disinfection of water, chlorination control is effected through close checks on residual chlorine present, both free and combined.

In sewage treatment, the pH in digestion is a primary controlling factor. In sludge conditioning for vacuum filtration, chemicals are employed to aid dewatering.

"Water and Sewage Chemistry and Chemicals." Revised by Kenneth W. Cosens, Ohio State University. PUBLIC WORKS, October.

Reducing Evaporation From Reservoir Surfaces

In Kenya, South Africa, evaporation from reservoirs and other water surfaces amounts to from 4 to 8 or 10 feet a year. In an effort to reduce this loss, the East African Meteorological Dept. is experimenting with a procedure for covering the water surface with a thin film of cetyl alcohol. This is effected by dissolving in the water pellets of a product of the sperm whale's oil, at the rate of a pound per acre. These dissolve and produce a film only a molecule thick, continuous over the entire area. Tests indicate that this reduces the evaporation by 50 to 70%. It is considered probable that one treatment may be effective for several years. The government's Medical Dept. says that the film is harmless to humans, and is found to be innocuous to larvae, fish, insect, bird and other animal life.

"Cetyl Alcohol Controls Evaporation." By Harold C. Laycock, of the Dept. of Information of Nairobi. *Water & Sewage Works*, August.

Developments in Cloud Seeding

The author describes the theories, procedures and results and limitations of cloud seeding. It is not, he says, a cure for drought, nor a substitute for water storage and irrigation. The average increase obtainable under the most favorable circumstances appears to be about 10-15 percent, rather than the 50-100 percent that was estimated by some a few years ago. However, while the question a few years ago was: "Does cloud seeding work?", the

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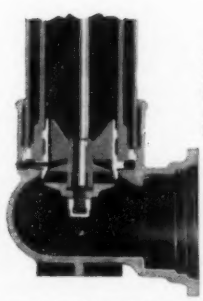

Main valve, true compression type, opens against and closes with water pressure. The higher the pressure, the tighter the valve. When hydrant is broken in traffic accident, there's no leakage with consequent dangerous loss of pressure.

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Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

question asked by scientists today is: "How well does it work?"

"Evaluation of Weather Modification Experiments." By Frederic A. Berry, Chief of the President's Advisory Committee on Weather Control. *Jour., AWW Ass'n,* **August.**

Irrigation in Humid Areas

Irrigation in the states was reported to have added, in 1953, from $400 to $62 per acre to the value of crops produced in Georgia; $282 per acre for tobacco grown in Virginia; and somewhat less in Missouri, Tennessee and Mississippi. The use of irrigation in the humid states is increasing and the potential water requirements of irrigation should be planned for now. "If efforts are made in this direction, few restrictions will be necessary and there should be enough water for everyone." This is the conclusion of John R. Davis, Asst. Prof. of Agricultural Eng., Purdue Univ.

On the other hand, Sheppard T. Powell, a consulting engineer, calls attention to the growing needs of water for manufacturing and other industrial purposes. In 1953, 11.4 trillion gallons of water was used for manufacturing, which added $121,700,000,000 to the national income. In contrast, 25 trillion gallons of water was used for irrigation of lands which grew crops valued at $2,400,000,000. The ratio of value added by manufacturing to that added by agriculture was thus about 140 to 1 for a given quantity of water used. Should arid lands be urged to produce, at great relative cost, more crop surpluses?

"Future of Irrigation in Humid Areas." By John R. Davis, Asst. Prof. of Agricultural Eng., Purdue Univ. and

"Relative Economic Returns From Industrial and Agricultural Water Use." By Sheppard T. Powell. *Jour., AWW Ass'n,* August.

Other Articles

The **75th Anniversary** of AWW Ass'n was the incentive to the preparation of a number of historical papers, as follows:

"75 Years of Improvement in Water Supply **Quality.**" By Abel Wolman.

"75 Years of Progress in Water Supply **Engineering.**" By E. Sherman Chase.

"75 Years of **Too-Cheap Water.**" By John H. Murdoch, Jr., Jour., AWW Ass'n, August.

"Nebraska Water Legislation and Associated Administrative Problems." By Dan S. Jones, of Dept. of Roads & Irrigation, Neb. Jour., AWW Ass'n, August.

"Recommended Action Against Effects of **Severe Droughts** in Kansas." By Dwight F. Metzler, Chf. Eng., Div. of Sanitation, State Bd. of Health. Jour., AWW Ass'n, August.

"Details of **Distribution Reservoir** Design," especially concrete linings and roofs. By Duncan A. Blackburn, Chf. Eng., Pasadena Water Dept. Jour., AWW Ass'n, August.

"Accidental Pollution of North Carolina Water Supply by **Octyl Alcohol,**" caused by a railroad wreck. By F. Rodwell Blaisdell, of State Bd. of Health. Jour., AWW Ass'n, August.

"Kodak Plant Operates Treatment Works to Meet 28 MGD Water **Need."** Water Works Engineering, September.

"Early Pennsylvania Water Supplies." By Howard E. Moses, of Bureau of San. Eng., Penn. Dept. of Health. Water & Sewage Works, August.

"Metering and Rate Structures." A review of U. S. practices. By E. Sherman Chase. Water & Sewage Works, August.

"Tastes and Odor Control." The **32nd** of a series on Water Works Practices. By George E. Symons. Water & Sewage Works, August.

"The Impact of **New Industry** on Water Supply and Pollution." By B. A. Poole, Chf. Eng., Ind. State Bd. of Health. Water & Sewage Works, August.

One Bright $ Sign in the Water Line

Most operations in the water processing line cost money . . . with little or no opportunity to make them pay for themselves.

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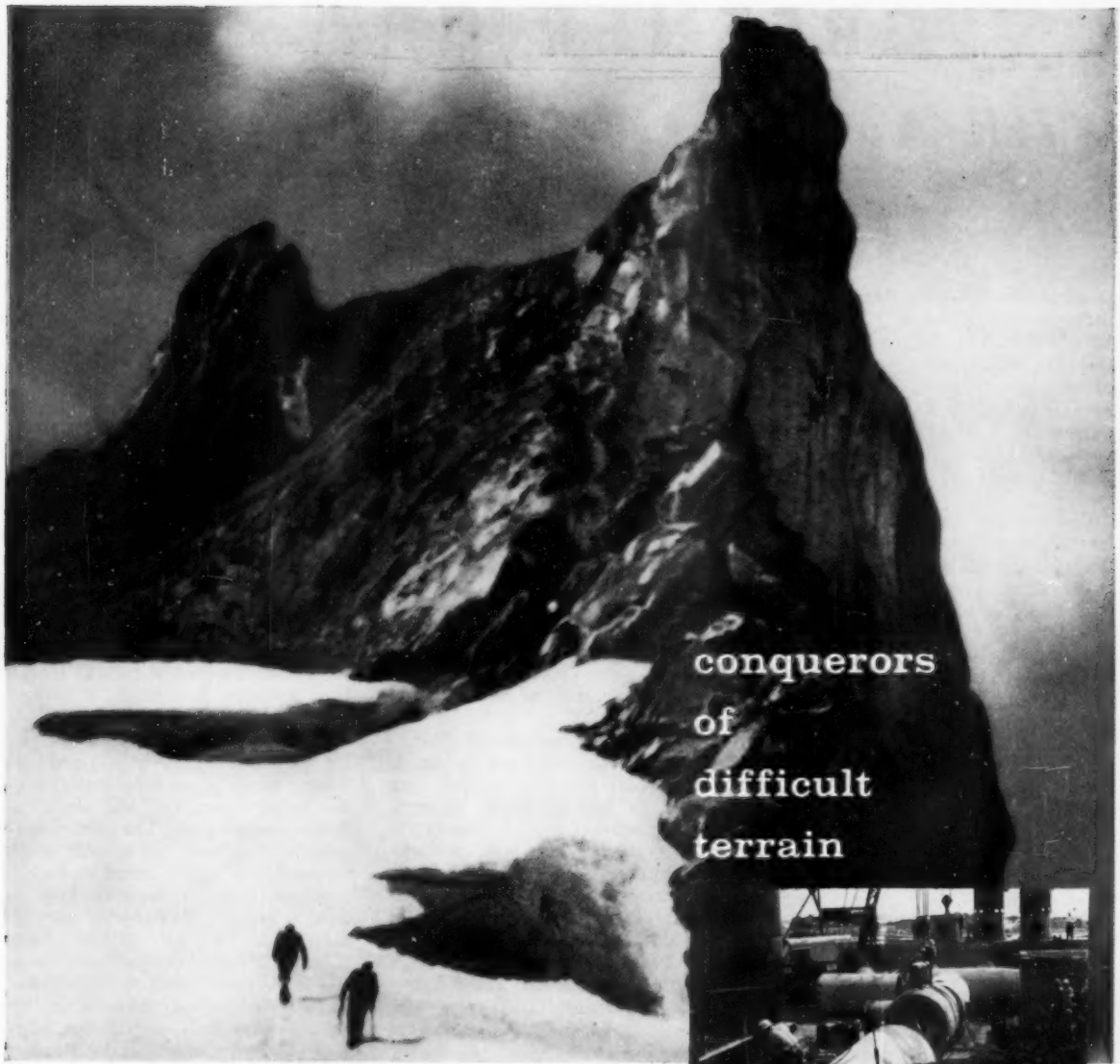

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GREENER GRASS

With Automatic Sprinkler Systems

GRASS is greener in many Denver, Colorado parks because of the installation of new and economical automatic sprinkler systems. Denver's Park Department estimates that the new systems, employing 130,000 feet of flexible pipe made of Bakelite polyethylene will help reduce water consumption by at least 20 percent, cut irrigation labor requirements to one-fifth of what they were, and at the same time make the 30 city parks more attractive as recreation centers.

Denver's park maintenance problem is complicated by the fact that the average annual rainfall is only 14 inches, most of which does not come during the growing season. The Park Department estimates that it must use about 550,000 gallons of water on every acre of park during the 22-week growing season, an average of one inch per week.

To put all this water on the city's parks requires a great deal of manpower. Several hundred men spend the bulk of their time during the summer moving portable sprinklers. Underground sprinkler systems could free these men for other maintenance work.

David M. Abbott, Director of Parks, suggested plastic pipe as a possible way to reduce the high first cost of an installed system. Over a period of three years the park Department ran a series of tests to see how well plastic pipe would stand up to their conditions. The pipe had to be able to withstand 50 pounds of working pressure; withstand freezing and thawing without deterioration or distortion; endure the weight of heavy mowing equipment; and resist the buildup of mineral deposits.

● **AUTOMATIC sprinkler systems in Denver parks will use 130,000 feet of polyethylene pipe. It is estimated that watering labor costs will be cut 80 percent.**

When Denver floated a $2,000,000 bond issue to rehabilitate its parks, roughly half the money was earmarked for new sprinkler systems. About 130,000 feet, or nearly 25 miles, of polyethylene pipe, in diameters ranging from ¾ of an inch up to 2 inches has been purchased from various companies, including Gates Rubber Co., Johnson Plastic Corp., The Plastex Company, Triangle Conduit and Cable Co., and Yardley Plastics Company.

The material and installation cost for the sprinkler system in Dialey Park, a 3½ acre block in one of Denver's older residential districts, came to approximately $7,000, of which about one quarter was for pipe. In addition to polyethylene pipe, asbestos-cement pipe of three-inch diameter was used for certain large arterial lines.

An innovation in the new sprinkler systems is the use of polyethylene tubing in the automatic control system which turns on and shuts off banks of sprinklers. The control system is regulated by a time clock located in a vandal-proof unit.

Since Bakelite polyethylene is light in weight, stretches of pipe up to 200 feet long can be laid in one piece. A 200-foot coil of 2-inch pipe, the largest size used in the Denver Parks, weighs only 89 pounds. By taking advantage of its flexibility and physical properties, the Department developed modified pipe-laying techniques that helped to reduce installation costs and to minimize the time that playgrounds would be inoperative.

● **PLASTIC pipe is laid in trench.**

● **SPLIT couplings fasten to pipe.**

● **RISER and sprinkler are placed.**

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it must be strong . . . tough . . . uniform . . . and durable.
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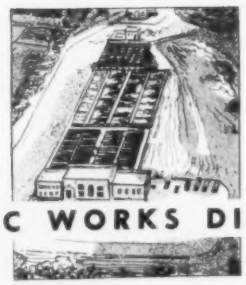


PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Effects of Syndets On Activated Sludge

The author of this paper conducted laboratory experiments to study the effects of synthetic detergents on the activities and characteristics of the active, aerobic, biological community composing activated sludge. In this work he employed the common anionic type of surface active agents, Nacconol; the cationic agent Ceepryn; and the nonionic type Tween-80, which is in only limited use. From the results obtained he draws the following conclusions: The effect depends on the type of syndet and the concentration present in the sewage. Both anionic and cationic detergents affected the sludge; the nonionic did not. Nacconol is rapidly adsorbed by activated sludge and subsequently interferes with adsorption by the sludge of colloidal food material. The degree of interaction of anionic and cationic syndets is a function of the pH of the medium. In general, endogenous respiration of the activated sludge organisms was affected to a lesser degree than the oxidative mechanisms. Increasing the sludge solids content will aid in diminishing the drastic effect of the ionic and cationic syndets. The adverse action of synthetic detergents involves the degradative or energy-releasing reactions and mechanisms.

"Effects of Synthetic Detergents on Activated Sludge." By R. M. Manganelli, Asst. Prof. of Sanitation, Rutgers Univ. *Water & Sewage Works*, September.

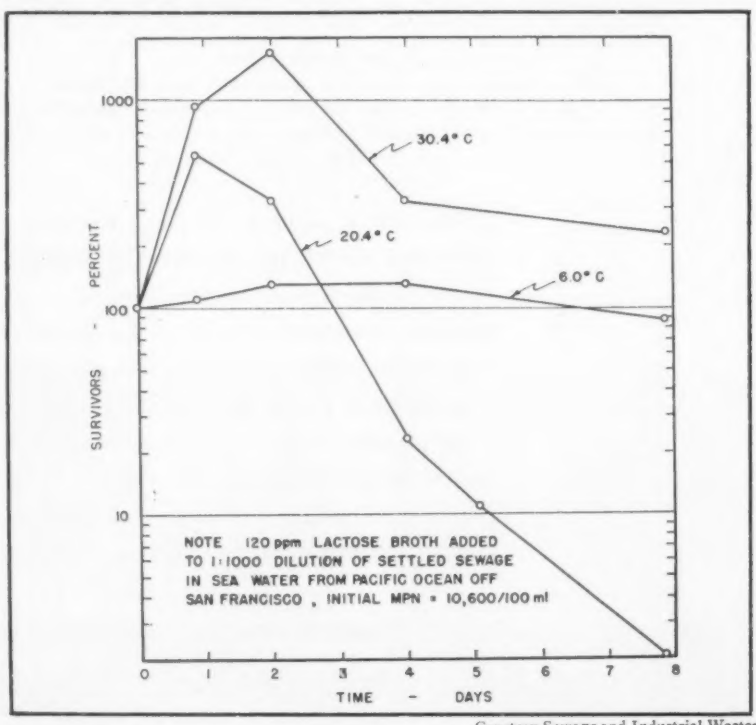
Viability of Bacteria In Sea Water

The author has tabulated analyses of 20 reports on studies of bacterial viability in sea water made by various investigators between 1885 and 1955. They indicate that most pathogenic forms suffered high mortalities during the first few hours of exposure but a few cells survived for much longer periods, in some cases more than one month. The mortality of the coliform group generally exceeded 90% within 1 to 3 days, although ultimate survivals in excess of one month have been reported. Sedimentation and adsorption are significant factors in removing terrigenous bacteria from sea water in the immediate vicinity of the point of discharge. Wind, wave and current action may act to prevent deposition, to resuspend deposited bacteria, and distribute contamination through the entire depth of water surrounding the outfall. The addition of organic nutrients to sea water may offset the bactericidal effect by stimulating bacterial growth. In laboratory studies, the length of the lag period, the maximum growth level, and 90% mortality time were directly proportional to the concentration of lactose broth added to sewage-sea water dilutions. An increase in temperature generally increases the rate of bacterial die-away and shortens the lag period. Other bactericidal effects, such as the action of sunlight, bacteriophage and salinity, are conceded by most investigators to be of relatively little importance. Predation by higher aquatic forms may contribute to bacterial removal, but this effect has not been well evaluated. The comparative viability of pathogens and nonpathogens still is not adequately defined.

"Viability of Sewage Bacteria in Sea Water." By Gerald T. Orlob, of Univ. of California. *Sewage and Industrial Wastes*, September.

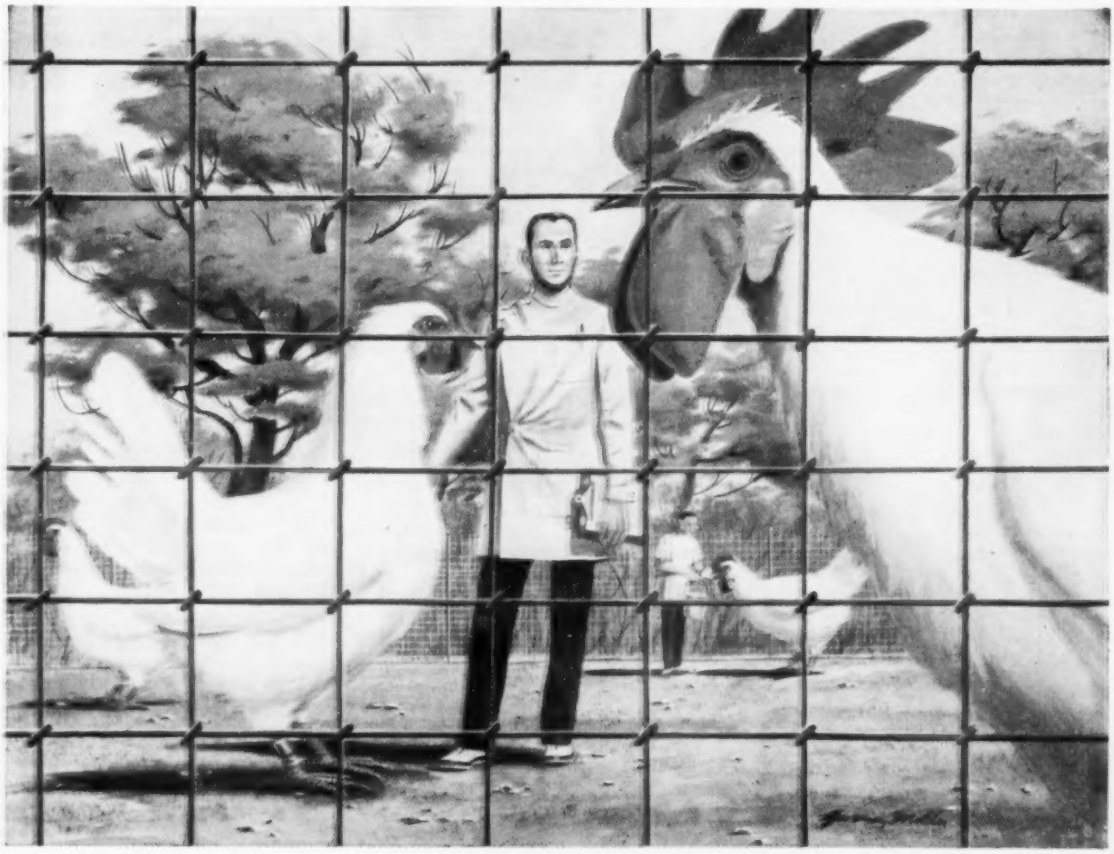
Winter Suspension Of Secondary Treatment

Lackawanna, N. Y. treats its sewage in a plant which provides secondary treatment in trickling filters. The effluent is discharged into a Class D stream. The effluent from the primary treatment alone


1000
100
10
PERCENT
SURVIVORS
30.4° C
20.4° C
6.0° C
NOTE 120 ppm LACTOSE BROTH ADDED TO 1:1000 DILUTION OF SETTLED SEWAGE IN SEA WATER FROM PACIFIC OCEAN OFF SAN FRANCISCO , INITIAL MPN = 10,600/100 ml
0 1 2 3 4 5 6 7 8
TIME - DAYS

Courtesy Sewage and Industrial Wastes

● **WHEN sufficient nutriment is present, an increase in temperature may result in a bacterial growth in sea water, a condition otherwise likely to be unfavorable.**



By changing the character of hormones and genes science may increase tremendously the size of fowl and domestic animals . . . put more meat at less cost on the American table.

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How will we live, eat, travel in the future? Even scientists must include some guesswork in their predictions of the marvelous things to come. But one thing seems certain—water and gas will still be carried by the dependable, long-lasting cast iron pipe laid today. Here's proof! More than sixty American cities are still being served by cast iron water and gas mains over a century old. And today's modernized U. S. Pipe...centrifugally cast, quality controlled . . . is even stronger, tougher, and more durable.

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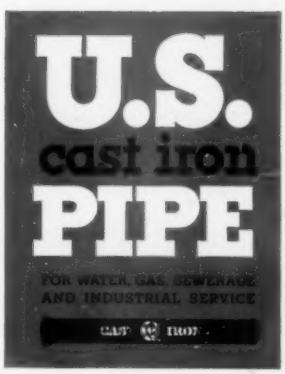

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more than satisfied the minimum standard for such streams set by the State Water Pollution Control Board, and the State Health Dept. granted permission to suspend the secondary treatment during winter under certain conditions, which would provide abundant dilution at the point of discharge. Experience has led to the following opinions by the superintendent of the plant: Elimination of trickling filter effluent during six months, October to May, eliminates the shock on the digestion system of unloaded sludge from the trickling filter during the summer. However, the suspension of secondary treatment must be strictly supervised, using adequate control tests. The filter would be placed in operation early in the spring and within three weeks it should reach its optimum operating condition. The voids between the stones are at a maximum and can easily store the stabilized secondary sludge throughout the warm summer months, when a top-quality effluent is essential. In the latter part of October or early November, gradual shutdown of secondary treatment can be started, and by forced unloading, the stones can again be cleared up and the filter made dormant for the winter.

"Suspension of Secondary Treatment During Winter Months." By Thaddeus J. Pieczonka, Supt. *Sewage and Industrial Wastes*, September.

A 7-Mile Subaqueous Outfall Sewer

The Hyperion sewage treatment plant of Los Angeles is to be changed from a high-rate activated sludge plant to primary treatment only; instead of secondary treatment, clarified effluent and digested sludge will be piped 6.75 miles to sea and discharged at a depth of 300 ft. The change is being made because of the high cost of filtering and drying the digested sludge for fertilizer and the low return from fertilizer sales. Enough plant effluent is to be added to the sludge to minimize clogging and sediment in the pipe. The pipe line consists of 22-in. OD high-strength steel pipe with a ½ in. cement mortar lining spun on, and a triple-wrap coating of coal-tar enamel reinforced with several layers of fiber glass and asbestos felt; covered with 1½ in. of reinforced gunite. The gunite not only protects the pipe but also provides weight to give the pipe line negative buoyancy; for which reason also heavy pipe, with ⅜ in. wall thickness is used. A complete cathodic protection system is provided, including a testing system to monitor the condition of the coating. Contracts have been let for the steel pipe, lined and coated, at $25 a foot; and for installing the offshore line at $34.50 a foot.

"Engineering Goes to Sea." By David R. Miller, Asst. Project Eng. PUBLIC WORKS, October.

Utilization of Waste Waters

The author summarizes published data of experiences in the United States, particularly in the west, of direct use of sewage and other waste waters by industry, agriculture, recreation and in other ways. He cites instances of use by industries, for cooling water, of effluents from trickling filters and activated sludge treatment, and also reuse of water from their own plants. The practicability or desirability of using sewage, wastes from the processing of vegetables and milk, and other waste waters, for irrigation is dependent on the factors of soil condition and climate. Where these are

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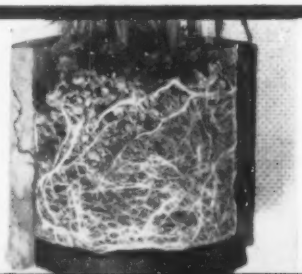

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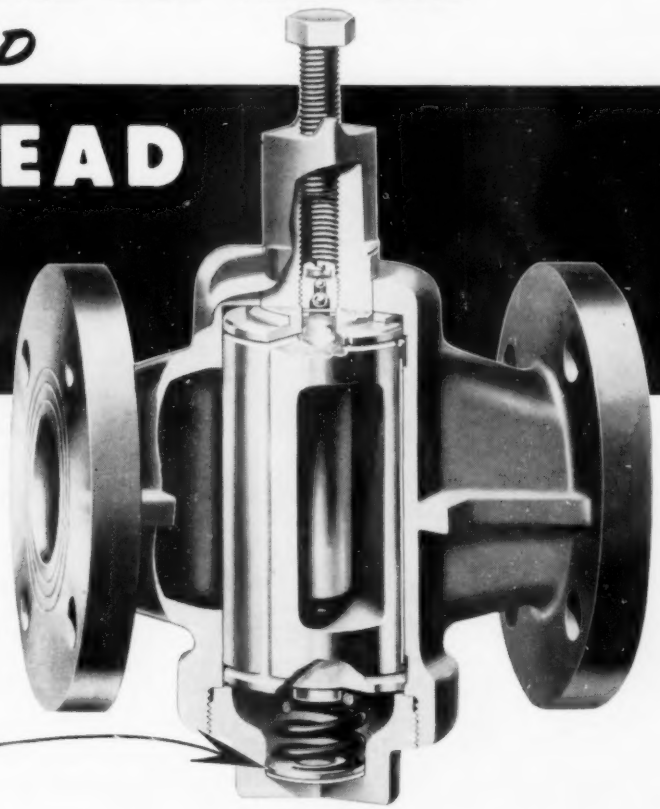

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Low friction Teflon washer permits spring to turn with plug. This means that less maintenance and longer life are assured, because the spring is subjected to compression only.

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9. Seating surfaces protected in both open and closed positions.
10. High pressure lubricant system provides full lubricant seal around ports.
11. Self-freeing plug prevents sticking.
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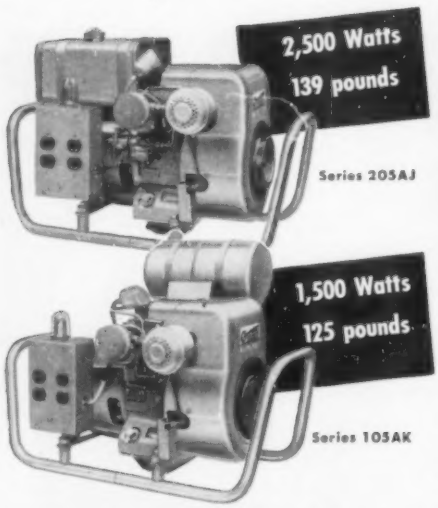

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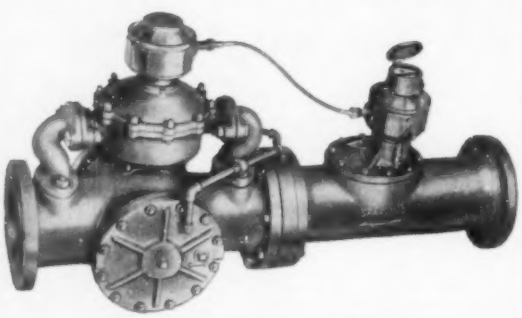

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favorable, good results are obtained in California in growing cotton, alfalfa, corn, citrus fruits and sunflowers, in irrigating pastures and golf courses and watering cattle. Recharging underground water with sewage effluents also is referred to.

"Direct Utilization of Waste Waters." By Robert C. Merz, Prof. of Civil Eng., Univ of So. California. *Water & Sewage Works*, September.

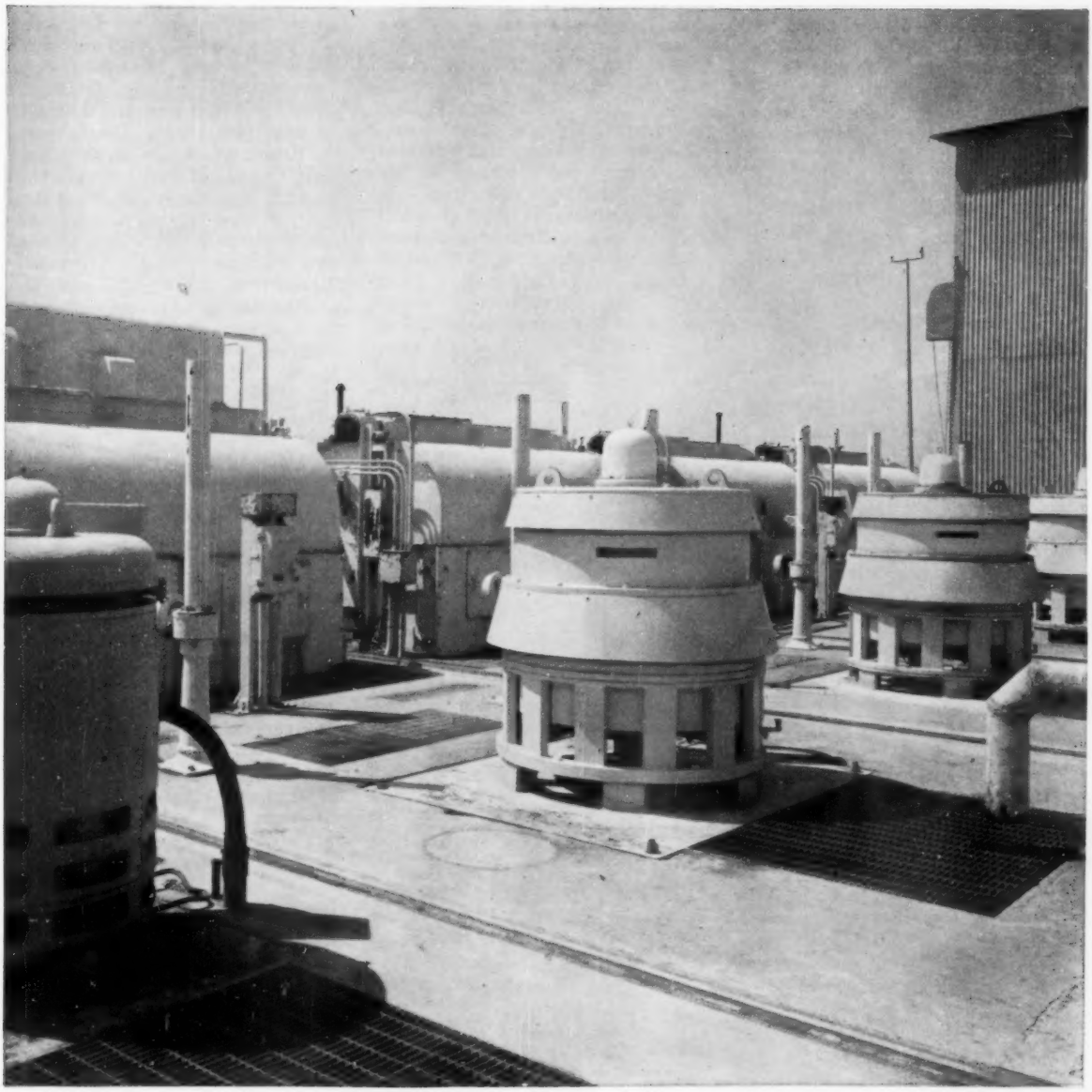
BOD Satisfaction By Fungi

The authors studied the oxygen-consuming capacity of eight commonly isolated species of fungi. They found that the capacities of these fungi equal or exceed those of *B. aerogenes* and other bacteria in pure culture at pH 7.2. Their activity in pure culture increased as the reaction of the medium became more acid and decreased as it became more basic. When using mixed culture with 24 or 48-hr. settled sewage, fungi usually gave lower BOD values than the sewage seed alone, except that at pH 9.5 higher values were given. By themselves, mold seeds produced in most cases a lower BOD than did sewage seeds alone or mixtures of mold seed and sewage seed. Results indicate that, with only molds, significant reductions in dissolved oxygen can be achieved in the first four days of incubation at pH 2.9; while the greatest reduction with sewage seeds alone occurs at pH 5.1 and 7.2. The strains of fungi tested are able to compete successfully with other microorganisms for organic materials in solution and for oxygen available in the dissolved state.

"BOD Satisfaction by Fungi." By Wm. Bridge Cooke, W. Allan Moore and Paul W. Kabler, of the Robert A. Taft Sanitary Engineering Center. *Sewage and Industrial Wastes*, September.

A Two-Point Method For Estimating First-Stage BOD

The author describes a procedure which makes possible the calculation of BOD curve constants from a relatively small amount of work in the laboratory and at the calculator. Results compare favorably with those of more extended methods. The laboratory work must be so arranged that complications resulting from lag and nitrification phases of the BOD reaction are eliminated. The procedure should be used frequently, especially with industrial wastes which sometimes have a



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curve which fits no formulation.

"A Two-Point Method for Estimation of First-Stage BOD." By G. A. Rhame, of Water Pollution Control Authority, South Carolina. *Sewage and Industrial Wastes*, September.

Survival of Tubercle Bacilli

This article describes a study made to evaluate the effectiveness of artificial sewage treatment processes and natural self-purification in streams in reducing the number of tubercle bacilli. No such bacilli were found in sewage from three different municipalities; but in the raw sewage at four different sanatoria they ranged from a low of 425 to a high of 10,000 per milliliter. Sedimentation, septic tank treatment, trickling filters and activated sludge were not effective in removing tubercle bacilli from the treated sewage; but chemical coagulation with ferric chloride and intermittent slow sand filtration were effective. Chlorination to a residual of 2 ppm with a contact time of 30 min., or to a residual of 1 ppm with a contact time of 1 hour, is required for effective destruction of tubercle bacilli. Sludges produced by primary and secondary treatment methods contained the tubercle bacilli which were not destroyed by anaerobic sludge digestion and air drying of sludge in open sand beds. Storage of fresh water infected with tubercle bacilli for 6 days and of similarly infected saline water for 24 hours did not eliminate the tubercle bacilli. The rate of decrease of these organisms was greater in saline waters than in fresh waters.

"Enumeration and Survival of Human Tubercle Bacilli in Polluted Waters." By H. Heukelekian and M. Albanese, of Rutgers Univ. *Sewage and Industrial Wastes*, September.

Investment in Public Sewerage Systems

Replacement value of public sewerage system facilities, expressed in constant 1954 dollars, increased from $17.5 billion in 1940 to $19.9 billion in 1955. The percapita replacement value declined from $237 in 1940 to $201 in 1955. Systems necessary to provide adequate service in 1955 would have had a replacement value at $25.7 billion instead of the actual $19.9 billion, the difference, $5.8 billion, representing the backlog of construction needed to provide adequate sewerage facilities according to present standards. To provide such facilities by 1975 would require the expenditure, in 1954 dollars, of the $5.8 billion, plus $8.1 billion to offset depreciation, and $8.7 billion for growth; a total of $22.6.

"Summary of Information on Public Sewerage Systems Capital Investment Values." By Walter A. Picton and A. T. Levie, of U. S. Dept of Commerce. PUBLIC WORKS, October.

Other Articles

"Criteria of **Pollution and Strength** of Sewage." By A. W. M. Coaker and K. A. Murray of Dept. of Chemistry and Chem. Eng., Univ. of the Witwatersrand, So. Africa. The Surveyor, Aug. 18.

"Two New **Incinerators**," a 450-ton and a 600-ton for Rochester, N. Y. By John V. Lewis, Dir. of Maint. & Operation, and Newell L. Nussbaumer, Consult. Eng. American City, September.

"Correlation of **Trickling Filter Data**" on filter loading and performance. By John M. Fairall, Eng., Iowa Dept. of Health. Sewage & Industrial Wastes, September.

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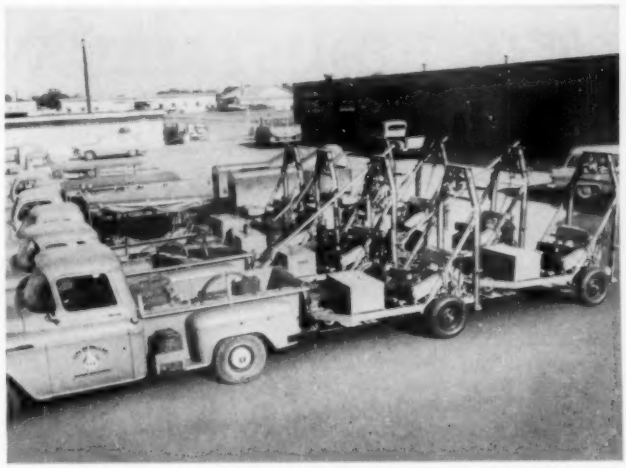
The greatly increased cleaning capacity per worker can be credited to the foresight of Superintendent Henry Graeser. In 1951 he started a modernization program. Today the sewer crew is equipped with this mechanized fleet of "Flexible" Bucket Machines and SeweRodeRs.



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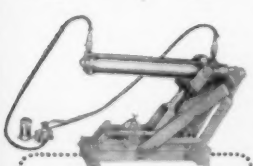

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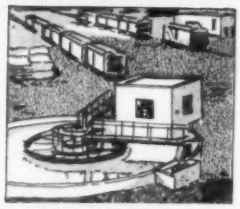

PUBLIC WORKS DIGESTS

THE INDUSTRIAL WASTE DIGEST

Gasoline Quality and Air Pollution

To compare the composition of thermally cracked and present-day premium gasolines with respect to those types of hydrocarbons which were found to be highly reactive smog producers, irradiation procedures and analytical methods were employed to measure reaction products from the individual hydrocarbons. It was found that internal double bond olefins as well as branched chain a-olefins are readily oxidized upon irradiation in the presence of the nitrogen oxides. Present day higher qualities gasolines have a higher percentage of these components than formerly. This change, however, may be only one of the factors contributing to smog intensity. About 1600 tons of hydrocarbons are released daily to the atmosphere in the Los Angeles area, 400 from gasoline vapor loss and 1200 from automobile exhaust. Results have been obtained so far on the decelerating cycle of engine operation.

"Effects of Present-Day Fuels on Air Pollution." By Paul P. Mader, Merlyn W. Heddon, Marcel G. Eye, and Walter J. Hamming, Los Angeles Co. Air Pollution District. *Industrial and Engineering Chemistry*, September.

Acclimation of Organisms to Toxic Organic Compounds

Some industrial wastes contain organic chemicals which are not readily attacked biologically because they are rare in nature and naturally occurring organisms able to utilize these materials as food are not numerous. The necessary organisms must be developed before a valid estimation of the pollutional characteristics of a waste may be made. In studies for evaluating the pollutional characteristics of acrylonitrile, acrylamide monomer, and oxydipropionitrile as examples of complex organic compounds, determining an exact BOD was considered of secondary interest. The procedure included determination of the COD value of the pure compound; collection and filtration of river samples; and checking COD values of river samples after the complex organic compounds were added to observe the progress of acclimation of the organisms. The results indicated a considerable time lag for initial acclimation to occur, but much quicker response on redosing the samples with the compounds. The tests were coordinated with microscopic examinations. Comparison of BOD tests of samples seeded with sewage organisms and those seeded with acclimated organisms showed the former to yield results only 17 percent of the actual value.

"The Assimilation Behavior of Certain Toxic Organic Compounds in Natural Water." By A. B. Cherry, A. J. Gabaccia and H. W. Senn, American Cyanamid Co., Pearl River, N. Y. *Sewage and Industrial Wastes*, September.

Adaptation Procedures of Microorganisms

In microbial attack on a product, the control of one species often prepares the environment for occupancy by another group able to resist the applied inhibitory agent but had not been able to compete with the normal inhabitants. It is fairly certain that any set of characteristics shown by a species are adaptive in that they fit that organism better than any other to an environment to which it now has access or has had access. It is generally accepted that individuals fathering the "fitter strains" arise because of sudden change in the genetic makeup passed on at cell division. Mutants with great resistance to antibacterial substances are obtained when the substances are specific in their mechanism of action. Resistant mutants may be expected to involve a mechanism of keeping the lethal agent away from the cell substance. It is now known that induced or adaptive enzyme formation occurs, but many examples of environmental modification that have adaptive value are complex. In microbial processes in industry it is recognized that the production of a product may be affected by minor changes in environment, and the food concentration that is optimum for a given aeration level or pH must be modified if one or the other of these is changed slightly.

"Microbial Adaptation". By Orville Wyss, University of Texas. *Industrial and Engineering Chemistry*. September.

Refinery Waste Treatment by Activated Sludge

Biological oxidation processes have only recently been applied to the treatment of refinery wastes, when pilot and laboratory studies indicated the applicability of trickling filter and activated sludge processes. A preference for the activated sludge process has been shown, based on lower investment cost, anticipated higher oxidation efficiencies and the availability of low-cost electric power. The utilization of sludge recirculation in the aeration basin for metabolic oxidation or endogenous respiration of excess bacterial growth, thereby eliminating separate digestion equipment, is another advantage of activated sludge treatment. The Sarnia Refinery of the Sun Oil Co. treats process wastes containing the main oxygen consuming contaminants, consisting of a 200 gpm flow and containing more than 95 percent of the phenols, sulfides, mercaptans, emulsified oils and other contaminants. The activated sludge unit was designed primarily to reduce phenol and phenol derivatives. The plant utilizes an API separator and an earth wall aeration basin. The Imperial Oil Co. utilizes the activated sludge process at its Sarnia, Ontario, refinery to treat 245 gpm of waste containing 800 lb. per day of phenolics. The plant units include an Aero-Accelator and an

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The question "what joint?" to meet *all* three requirements effectively, was quickly decided by the officials. TYLOX—which makes pipe joints leak-proof with a rubber-tight, compression seal, cuts construction costs by speeding pipe laying, and never deteriorates because of special compounding of its rubber—was the *only* pipe joint able to fill the bill. By specifying TYLOX, officials assured most for the taxpayer's money on all three counts.

* **PROJECT:** Irrigation line—Hidalgo County Water Control and Improvement District No. 16, Mission, Texas.

ENGINEERS: Charles L. Melden, Civil Engineer, Edinburg, Texas, and A. Tamm, Consulting Engineer, Harlingen, Texas.

CONTRACTOR: Heldenfels Bros., Corpus Christi, Texas, and F. M. Reising, Edinburg, Texas, Sub-Contractor.

PIPE: T & G Concrete, sizes 12" to 30", supplied by Longhorn Concrete Pipe Company, Edinburg, Texas.

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Accelo-Filter. The refinery of the General Petroleum Corp. at Ferndale, Washington, treats 720 lb. of phenol per day at a rate of 300 gpm. The plant units include two Aero-Accelators, sludge aeration basins, a flocculation basin, sludge thickener, and a floating cover digestion tank.

"Activated Sludge Process Applications to Refinery Effluent Waters." By Harold F. Elkin, Sun Oil Co., Philadelphia. *Sewage and Industrial Wastes*, September.

Factors Affecting Growth of Algae

Research has been stimulated in the role of algae and its photosynthetic efficiency in the field of water purification (or waste treatment). Much remains to be done before maximum utilization may be made of this system. Not all algae metabolize as phototrophs; *Clorella* may function as such in the light or may obtain energy from reduced carbon compounds in the dark. Consequently not only the time of day, but depth, turbidity, and organic content of the body of water are important. The electromagnetic energy naturally available for photosynthesis is greater than that used under optimum conditions. In artificial light or under intermittent illumination, an alternation of 0.001 second of light with 0.01 second of dark will produce growth or oxygen evolution equal to about 90% of that produced by continuous illumination. Carbon dioxide requirements on the order of 0.03 percent, normally found in air, is sufficient to permit an optimum rate of photosynthesis. The toxic level depends somewhat on pH but appears to be between 5 and 10 percent in air. In those species of algae studied, only free carbon dioxide is active in photosynthesis and carbonate ions may be inhibitory. Favorable temperatures vary normally between 10° and 40°C, but some species grow at 89°C. Nutrition plays an important role in photosynthesis, inorganic components in particular.

"Photosynthesis in the Algae." By Robert W. Krauss, University of Maryland. *Industrial and Engineering Chemistry*, September.

Using BOD, COD and Odor Tests for Industrial Wastes

Threshold odor tests are usually run on wastes to limit odorous organic material reaching surface water supplies. Since odors may be evaluated only by personal reactions, requirements should be established which will enhance the sensitivity of the observer. Integration of opinions and other current data indicates: that the true BOD is difficult to determine because of the "seeding" problem, and some waste components are resistant to destruction in streams, oxidizing slowly, degrading stream quality for many uses. BOD-evaluation of industrial wastes could lead to under-design of biological treatment plants, because unsuspected loads could exceed the treatment capacity as microorganisms acclimatize to the waste composition. Therefore extensive pilot plant studies and protracted BOD investigations should be utilized. Chemical oxygen demand tests (COD) give rapid measurement and determine most of the oxygen which can be used in oxidizing carbon compounds. Joint use of BOD and COD tests is advantageous, and analysis of the cause of the difference between the two values may develop significant information.

"Evaluation of Methods Currently Used to Determine B.O.D., C.O.D., and Odor for Industrial Wastes." By M. B. Ettinger, Robert A. Taft Sanitary Engineering Center. *Sewage and Industrial Wastes*. September.

Surcharges for Industrial Waste Loads

The City of Cincinnati has developed a formula of surcharges for excess waste strengths imposed on industries to offset construction, maintenance and operation costs for disposal. Original surveys had indicated that 36 industries contributed 83 percent of the high-strength wastes. As the result of a subsequent survey those industries with increased waste strengths have been assessed increased surcharges. If resurveys are made at the request of the industry, reimbursement is sought for at least a portion of the expenses. Under the impetus of the industrial waste control ordinance, industry has reduced waste strengths and undertaken water conservation measures to reduce both surcharges and service charges. The additional plant capacity for treating high-strength wastes was provided at the urging of industry who argued that the industrial waste portion of the "enlarged" facilities would be amortized directly by industry paying the surcharge. Notwithstanding the resulting benefit of waste reduction, it is possible that revenues from the surcharge could drop to an inadequate level. For control work, a Beckman spectrophotometer is used by the Sewage Disposal Section. A sampling and gaging trailer, automatically recording pH and flow is used in the field.

"Industries Pay Surcharges for Waste Discharges in Cincinnati." *Wastes Engineering*, September.

Distillery Waste Treatment and Disposal

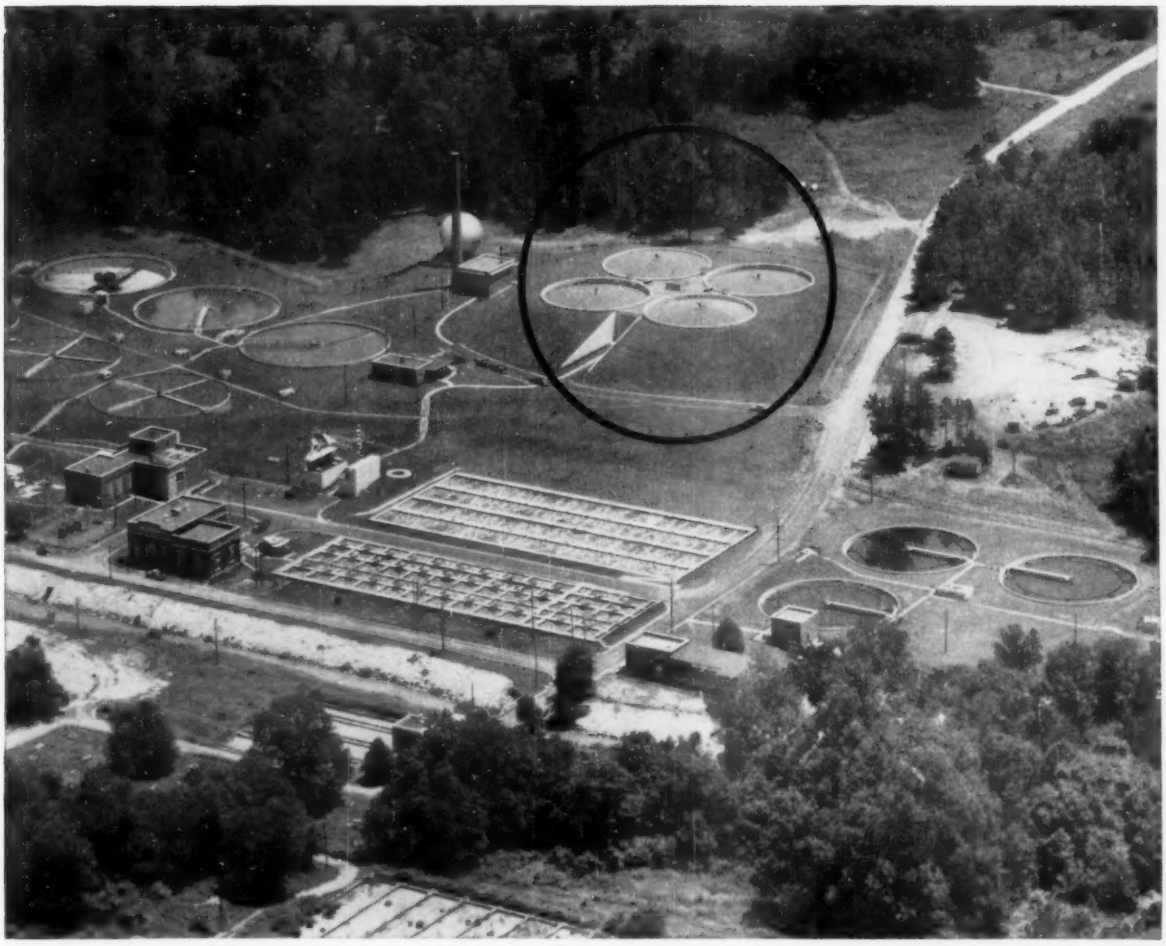
Disposal methods for distillery wastes in current use include discharge directly to sea, discharge directly to sewers, use on land, and treatment by sand filtration beds, contact beds, pits and lagoons. Evaporation of spent wash from malt distilleries is quite widely practiced, effecting a concentrate of about 50 percent solids which is passed to a film type roller drier. Typical treatment by percolating filters involves dilution of the spent wash using spent lees, steep water, wash water and clean water and treatment of the mixture with a lime slurry, followed by settling. Treatment of the effluent on a sand filter at a loading of 0.225 lbs. BOD per cu. yd. per day results in a 95-98 percent BOD reduction. Grain distilleries generally have a greater output per plant than malt distilleries. The size of the pollution load and volume of spent wash rules out the use of percolating filters, but as in the case of malt distilleries, insufficient solids are present in the other wastes to justify evaporation.

Partial treatment can be effected by anaerobic digestion. The presence of iron during fermentation in an anaerobic digester limits the production of H_2S, which previously caused nuisances.

"Whisky and Industrial Alcohol Distillery Wastes." By C. J. Jackson, Distillers Co., Ltd., England. *The Surveyor*, August 25

Sulfur Dioxide in the Atmosphere

The magnitude of possible pollution of the New York City atmosphere can be estimated from the fact that the equivalent of 32 million tons of coal are burned in New York City yearly and that the average sulfur content of bituminous coal is about 2.5 percent. Additional contributors are a million or more passenger cars, 200,000 trucks, buses, and more than 10,000 incinerators. Since 1953, air sampling has been routinely done daily for half-hour periods morning and afternoon using the Hatch modification of the Greenburg-Smith im-



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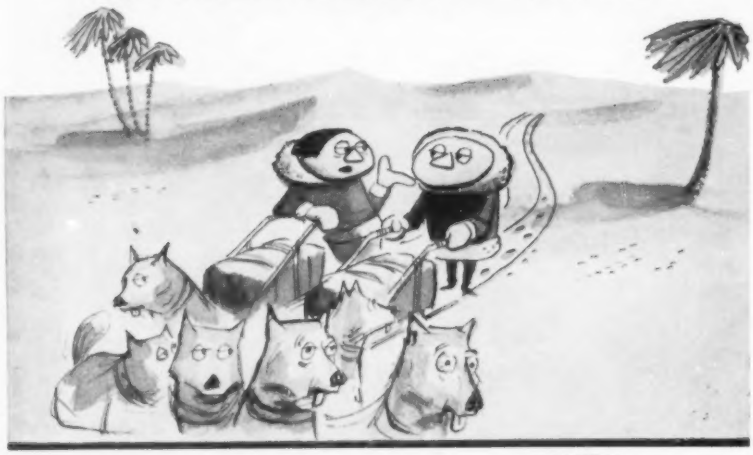

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pinger tube and every hour for 24-hour cycles using Wilson automatic impingers. Seasonal variation in sulfur dioxide concentration showed minimum values in July and August, maximum in December and January. Daily variations showed maximum values from 6 to 10 a.m. and minimum around 2 p.m. When no inversion occurs, dispersion is rapid in the New York area and concentrations are held to 0.01 to 0.07 ppm. The variation schedule is subject to change as more power is used for summer air conditioning.

"Sulfur Dioxide in New York City Atmosphere." By Leonard Greenburg and M. B. Jacobs, Dept. of Air Pollution Control, New York City. *Industrial and Engineering Chemistry.* September.

• • •

Roadway Maintenance

(*Continued from Page* 113)

carried in the bottom two-thirds. In pipes not under head, this is an important factor. We have few major bridges over thirty feet in length. There were, in past years, innumerable wooden box culverts placed. These were untreated and all rotted out about the same time. These are replaced by large arch pipe. On the smaller bridges, we have found Armco steel decking with a plant mix cover to be proving out well.

In the irrigation ditch district along the Columbia River, the insignificant root-eating gopher has become a maintenance hazard. Evidently, they get thirsty (as who wouldn't chewing on dusty clods) and head for fresh water. The nearest water, of course, is by tunnel right through the side of the closet irrigation ditch. With his last bite in the hole, he usually gets plenty of water, drowning in the process. This normally occurs between the hours of twelve midnight and three a.m., so the increasing leakage is not immediately detected. The resultant flood usually drowns out about a half a mile of County road. This irritates us and we demand that the irrigation personnel concrete their ditch. This irritates the ditch people and the ensuing hassle, while it may not properly be classed as maintenance, does require treatment to soothe frazzled nerves.

In this fast growing residential area, we have a water district. Several months prior to the construction season, we go to the water personnel with our oiling program, contract and otherwise. We suggest that it looks to us like this area is going to develop, and we are putting bitu-

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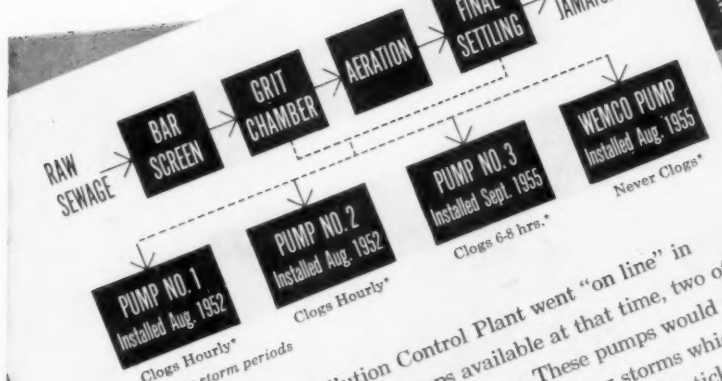
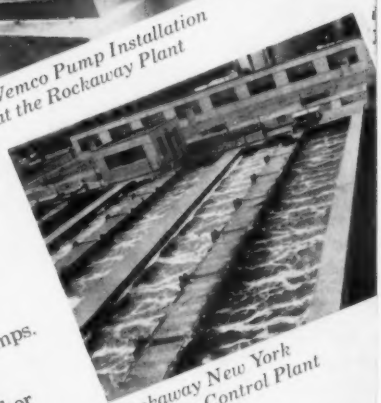
Rockaway New York Pollution Control Plant



Wemco Pump Installation at the Rockaway Plant



Rockaway New York Pollution Control Plant

The Rockaway Pollution Control Plant went "on line" in August 1952 using four pumps available at that time, two of which remain in the flow sheet above. These pumps would plug on an average of once every two hours during storms which washed in comparatively large amounts of rags and sticks. During August 1955 a WEMCO Torque Flow Solids Pump was installed as a replacement of one of the four original pumps. **The WEMCO Pump has never clogged** and has operated through numerous clogging situations during which the other pumps continued to clog as described.

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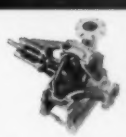

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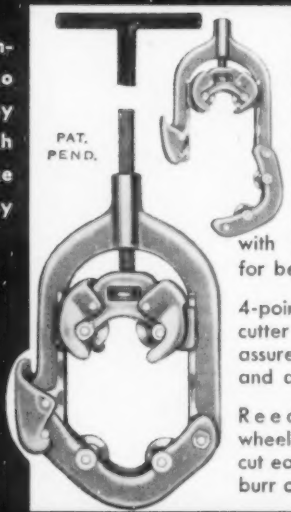
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

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minous surfacing on the streets; it would be nice if the water district would put in sufficient lateral crossings to handle possible housing developments. The water district immediately and emphatically declares that they will have no development in the area in the foreseeable future.

The oil has hardly set when here comes the water supervisor, saying something like this: "Blink and Blank just contracted to build fifty-seven houses along these streets." You've guessed it! With the increase of civilization (and Planning Commissions) outside plumbing is taboo; and bathrooms take water. So the water supervisor is just wondering if he might make sixty-two lateral crossings on the streets just oiled. This is a maintenance problem that is perpetual. For no matter what conditions you impose upon the water district, those lateral crossings will show as bumps for years on end.

Unfortunately, the majority of the roads established in the irrigated area were orchard plat rights of way. Consequently, all irrigation lines prior to about 1923 have precedent easement over the roads. Hardly anyone can remember the location of these lines. But we find them. Every time we attempt to ditch or widen a street, we find them, sometimes in such quantity that the countryside suddenly appears to have sprouted a crop of artesian wells. And if it is mid-growing season, these broken lines must be repaired immediately. For although people purchase dried apples, it is not off the trees.

We have also found that "Woodsman, spare that tree, touch not a single bough" is a pretty good rule, particularly if the offending branches are loaded with nearly ripe fruit, or if a heavy pruning would kill the tree. On some narrow rights-of-way, bordering old orchards, branches have interlaced, becoming a traffic hazard. In one instance, we located the right-of-way to find that the trees were planted right on the line. Overhanging branches were interfering with two-way traffic. So we requested the owner to prune them back. The owner told us (politely, of course) to jump in the Columbia River. We didn't take him seriously and decided to prune the trees with our personnel. However, this gentleman had a lawyer; and I must say that they are putting out restraining orders on a good grade of paper these days. So come and drive down our shaded lanes. They are lovely at apple blossom time.

Well, we've told you our maintenance troubles. Why don't you tell us some of yours. We are interested.

Spreading treated sand on 40 foot super highway is a one-pass, one-operator job with SEAMAN-ANDWALL CENTURY SPREADER.

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The CENTURY Model HY-4 is a profitable *dual-purpose* spreader. Can be converted in a few minutes to a seat coat unit. Just remove the spinner and attach the SEAMAN-ANDWALL seal coat tray.

THE SPINNER THAT STOPS SPINS!

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And the CENTURY can spread intermittently, a material-saving "must operation" for intersections, bus stops, curves or grades.

This finger-tip knob, operated by truck driver provides complete control of CENTURY spreader.

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Dept. R-227, Milwaukee 1, Wisconsin

INDUSTRIAL WATER QUALITY REQUIREMENTS

RICHARD D. HOAK

Senior Fellow,

Mellon Institute of Industrial Research

Pittsburgh, Penna.

This article has been slightly condensed from a paper presented at the Fifth Southern Municipal and Industrial Waste Conference at the University of North Carolina, Chapel Hill, North Carolina.

POLLUTION CONTROL agencies are faced with an almost impossible task. Their job is to control the discharge of spent water in a manner that will best serve the public interest; but the public interest is neither constant nor tangible. Each real or imagined public need is deemed, by those promoting it, to have first priority among the variety of water uses in a given locality. This frequently results in disagreement about the effectiveness with which a regulatory board is performing its function.

Industrial water quality requirements are often relatively easy to satisfy; in fact, many industries appear to have only a vague notion of the quality they need. Those industries which require water of specific quality normally take what is available and treat it to serve their purposes.

Up to 75 percent of the industrial water intake is used for cooling. Temperature, corrosion, and suspended silt are the primary quality factors in this use. Cooling towers and spray ponds are widely used to lower water temperature, but mechanical refrigeration is necessary in some cases. Corrosion is usually controlled by adding lime or soda ash. Suspended silt creates difficulties by eroding piping and fittings, and by clogging spray nozzles.

About 10 percent of all industrial water is used for boiler feed and this requires special treatment. Corrosion and scale formation in boilers are problems which increase in difficulty with operating pressures. Here corrosion is controlled by elimination of dissolved oxygen and by maintaining the concentration of free sodium hydroxide in an appropriate range. Mechanical deaeration and the use of oxygen scavengers, such as sodium sulfite or hydrazine, are used for removal of dissolved oxygen. Scale formation is controlled by softening or demineralizing fresh feed water, and by addition of phosphate ion and organic dispersives to insure precipitation of scale-forming substances as a loose sludge.

Of water supplied to industry some 35 percent is used in manufacturing processes. While water quality requirements for different manufactured products vary widely, industry can generally use water of low quality in comparison with water for domestic use. Except for a few specialized instances where water of the highest purity is needed, e.g., TV tube manufacture, the beverage and food-packing industries have the most demanding water quality requirements.

Brewing. For beer making, water must not contain nitrates or nitrites, must be taste- and odor-free, but should contain calcium sulfate. Passing the water through activated carbon for taste and odor removal and through gypsum to add calcium sulfate is commonly practiced. Ferrous iron must be absent or very low for it darkens the color of beer. The effect of the copper ion is not well understood but even a minute amount seems to cause "gushing," i.e., beer gushes out of a can immediately on opening. Fluoride ion has an adverse effect on brewer's yeast. No bicarbonates may be present, and the water should have a pH of about 6.4.

Food-packing. Dissolved substances are less important in food processing than in beverage manufacture. Copper decreases the shelf-life of packaged foods, particularly dairy and vegetable oil products. Although limiting concentrations are not known, copper or bronze fittings are

Table 1—Composition of Water For Pulps and Papers

(Maximum allowable limits, ppm)

	Soda and sulfate pulps*	Groundwood paper*	Kraft (sulfate) paper		Fine paper
			Bleached	Unbleached	
Turbidity	25**	50**	40	100	10
Color	5	30	25	100	5
Total hardness, $CaCO_3$	100	200	100	200	100
Calcium hardness, $CaCO_3$	50	—	—	—	50
Magnesium hardness, $CaCO_3$	50	—	—	—	—
Alkalinity, $CaCO_3$	75	150	75	150	75
Iron, Fe	0.1	0.3	0.2	1.0	0.1
Manganese, Mn	0.05	0.1	0.1	0.5	0.05
Silica, SiO_2	20	50	50	100	20
Dissolved solids	250	500	300	500	200
Free CO_2	10	10	10	10	10
Chloride, Cl***	75	75	200	200	—
Residual chlorine, Cl_2	—	—	—	—	2.0

* Not applicable to groundwood paper made from southern pine.

** Materials causing turbidity must not be gritty.

*** Chloride limits set to decrease corrosion of metal in equipment. For fine paper, chloride limited by maximum for dissolved solids.

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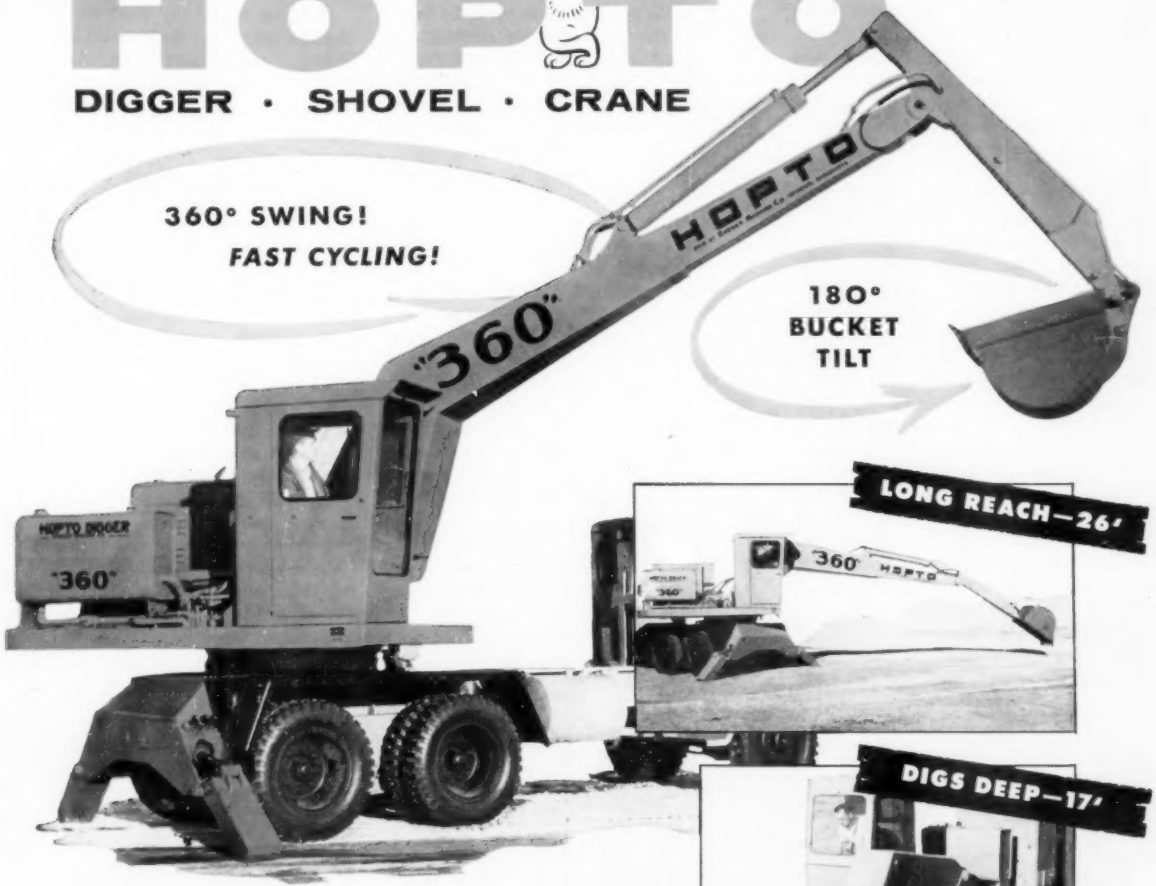

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carefully avoided in lines carrying such material. Fluoride ion is of importance because of its tendency to concentrate in spaghetti, baked beans, and cereals. The water must be tasteless to prevent off-flavor.

Leather processing. Few data are available because little work has been done on water quality for processing hides to leather. Any organic matter is undesirable because the protein in skin is subject to microbiological decomposition. Opinion about hardness, both temporary and permanent, is divided; some special degree of hardness is often thought to make the difference between success and failure in tanning processes.

Textile manufacturing. Hardness greater than about 50 ppm is undesirable because it may precipitate certain dyestuffs or cause soapbound stains. Most manufacturers use ion-exchange resins or phosphate treatment to reduce natural hardness. Manganese should not exceed 0.1 ppm, iron 0.3 ppm; these metals affect dye color. Color should be low, but pH may be in the range 6.5 to 8.5. Corrosion is sometimes a problem, largely because it may introduce ferrous ions.

Paper manufacturing — The pulp and paper industry has studied water quality extensively. Turbidity and color cause a loss in brightness and darken the color of white or tinted paper. Colored organic compounds often contribute to slime formation. Hardness causes scaling on equipment, and it reacts with resin size to form insoluble material which contaminates the product. Alum is used to precipitate the size, but enough must be added to neutralize all alkalinity before it will react with the resin. Iron and manganese discolor paper, and iron may also encourage the growth of iron-utilizing, slime-forming bacteria. Carbon dioxide in excess of 25 ppm may adversely affect sheet formation on the paper machine. The Technical Association of the Pulp and Paper Industry has adopted the specifications for water shown in Table 1.

Chemical manufacturing. Quality needs vary in the chemical manufacturing industry. As an example, one large company provides the following water qualities.

1. River water, chlorinated for slime control, as general service water furnishing heat exchange, fire protection, and some processing. It may vary as follows:

Turbidity, 15-40 ppm; color, 10-50 ppm; temperature, 33-85°F; dissolved oxygen, 6-12 ppm; alkalinity, 150-220 ppm (bicarbonate); calcium, 30-40 ppm; and magnesium, 15-25 ppm.

2. Lake water for feed to ion-exchange units and for special heat exchange may have the following range of characteristics: Turbidity, 0-30 ppm; color, 0-5 ppm; temperature 40-70°F; dissolved oxygen, saturated; alkalinity, 90-100 ppm; calcium, 15-20 ppm; and magnesium, 6-8 ppm.

3. Deep well water is used for summer heat exchange. The water is at 54°F, high in iron, low in oxygen, and contains 1000-7000 ppm dissolved solids.

4. Double ion-exchange water must be provided for special processes and boiler feed.

5. Potable water, softened, filtered and chlorinated is furnished for sanitary use and some processing.

Miscellaneous. One steel mill has found roll corrosion when chlorides in raw water exceed 175 ppm. A large chemical company has installed stainless steel equipment where chlorides exceed 150 ppm. High dissolved solids in electroplating baths may impair the quality of the plating. Air conditioning, baking, confectionery, and ice manufacturing

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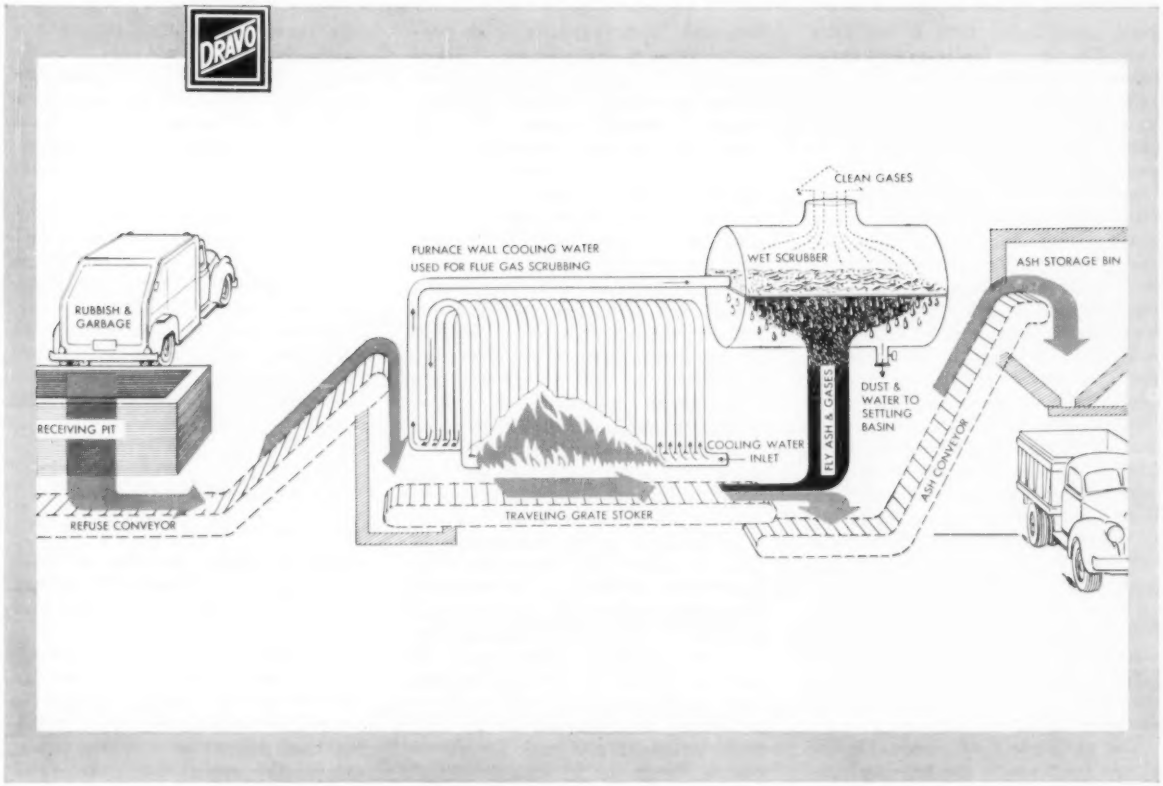

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The Dravo Incinerator is a complete package, including receiving pits, automatic refuse handling system, automatic combustion controls, traveling grate stoker, wet type flue gas scrubber, residue discharge conveyor and everything necessary for the efficient operation of the plant with minimum personnel.

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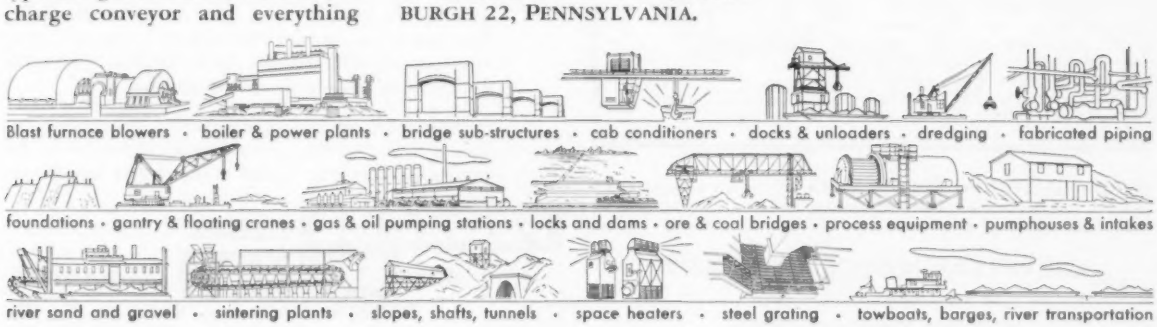

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must have water with a low odor level. The limits for iron and manganese for making Viscose pulp are 0.05 and 0.03, respectively, while manufacture of clear plastics requires that iron and manganese be less than 0.02 ppm.

Most industries find that excessive dissolved solids in their water supply cause a multitude of difficulties. The cost of these effects often cannot be accurately appraised, but the cost attributable to dissolved solids in steam generation can be evaluated. A study was made in this field by the Steel Industry Committee of the Ohio River Valley Water Sanitation Commission. The increased annual cost of steam generation resulting from a 10-ppm increase in sodium salts in the Monongahela and Ohio Rivers was calculated for 12 plants. Of the seven plants on the Monongahela, increased annual cost ranged from $554 to $7539. For five plants on the Ohio, the increased cost was $648 to $1511. The total increased annual cost for the twelve plants was $28,663. This illustrates the very real effect of a minor increase in dissolved solids.

The principle that reasonable use should be made of the self-purification capacity of streams is generally accepted. While capacity is an economic asset of great value, the fact is often overlooked that self-purification is normally limited to assimilation of organic matter. Although there are certain exceptions, dissolved inorganic compounds do not disappear from streams. Therefore limitations should be placed upon discharge of such material to prevent the concentration from exceeding predetermined maximum levels.

Selecting a limiting concentration for dissolved solids is a difficult problem; and when a limit has been decided upon, there remains the troublesome question of proper means to maintain it. There is an adequate basis for placing limitations upon some dissolved substances e.g., fluoride ion; but there is no rational procedure for limiting the concentration of most compounds, such as those that cause hardness. Regulation of discharge of dissolved inorganic compounds is largely a problem of economics. Surveys like the one described above might be used to arrive at a concentration level which should not ordinarily be exceeded, and the amounts which could be discharged could be apportioned among the various contributors. If a new industry were to locate upon a regulated stream and the concentration were near its maximum, however, would the new enterprise be required to remove its dissolved salts completely or would all other companies have to reduce their allowable discharges sufficiently to provide for the newcomer?

There are obvious difficulties in controlling the concentration of dissolved salts in surface water. These will be solved as new knowledge becomes available. In the meantime, regulation should be limited to those substances for which satisfactory data are available, or whose effects are genuinely harmful to public health.

• • •

Airport Maintenance

(*Continued from page* 98)

stands by during the day; an electrician at night. Almost 250 motors are used in heating, ventilation and air-conditioning.

B. Ventilation in the new terminal is of a complex type. The ventilation-circulation system, which is part of the original structure of the building, takes care of the open spaces—the main floor, the two-storied lobby, and a second floor

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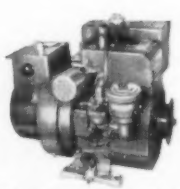

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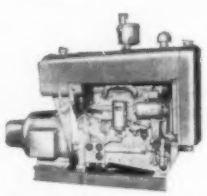

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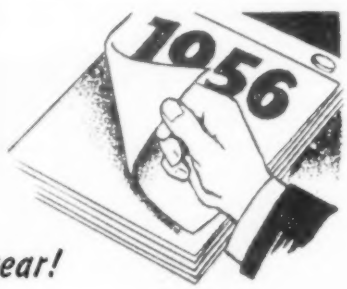

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mezzanine, which includes a 500-foot-long, glass-enclosed observation deck.

C. Paving and Road-Building: On the two runways last year, some 105,644 landings and take-offs were made. These runways (one is 6,860 feet long and 150 feet wide, and the other, the instrument runway, 7,000 feet long and 200 feet wide) with their related taxiways, parking aprons, parking pads about the field, require constant maintenance and improvement.

Constant patrol and inspections of the runways and other paved aircraft-use areas are maintained by both operational and maintenance forces at the airport. Extensive repairs have been necessary, particularly on the older areas because of differential settlement.

Runway marking must be kept in perfect condition. White markings, which conform to the latest CAA and International Civil Aviation Organization specifications include: solid strips, three feet wide, along the full length of each side of the runway; a dashed three-foot-wide center line; threshold markers at each end of the runway; distance markers 500, 1,000, 1,500 and 2,000 feet from each end of the runways; and numbers to designate the runway heading. Some 3,500 gallons of white paint are used in the marking job which lasts about two years. Experiments are now being made with plastic paint which may require only scrubbing once a year, and has longer over-all life.

When erosion washouts occur along road beds and adjacent to runways, extensive shoulders must be rebuilt. Drainage ditches on land catch the runoff of heavy rains. Last Summer, high water due to tidal action necessitated the hurried reinforcement of dikes adjacent to the New Jersey Turnpike and taxiway A.

In connection with drainage and prevention of soil erosion, extensive experiments are being conducted with various types of grass in landscaping the areas between runways, taxiways, access roads, etc. The present heavy beach grass requires constant care and weed control.

A major mosquito control program in the area is conducted by the mosquito control commissions of adjoining Essex and Union counties. The Port Authority cooperates fully with these agencies, taking care that new construction does not interfere with their operations.

D. *Equipment*: Each of the 53 major pieces of Port Authority maintenance equipment at Newark Airport has a case history on file. A current file card carries the location, lubrication history, repair dates, etc. of each piece. Equipment storage space consists of two garages, a warehouse, an old hangar which houses currently used equipment, and the maintenance shop.

The major automotive pieces are: (1.) Grass equipment—nine pieces of flexible equipment, such as tractors, powered field-type lawnmowers, and a fertilizer spreader; (2.) Equipment for plumbing and electrical work on hand are: ½-ton pickup truck, radio-equipped, ½-ton panel truck, 1-ton pickup truck, 1-ton panel truck, 4 portable generators, 1 floodlight trailer and 1 portable welder.

3. General utility equipment includes: 3 regular dump trucks, all radio-equipped all equipped for snowplow installation; 1 station wagon, radio-equipped; 1 power wagon with winch mechanism; 1 water tank truck; 1 grader; 1 5-ton roller; 3 road sweepers; 1 tractor crawler; 1 conveyor — Barber Greene; 2 tar kettles; and 1 salt spreader.

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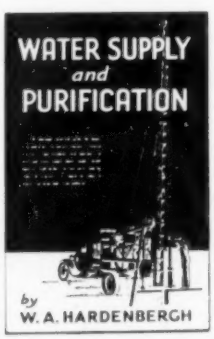

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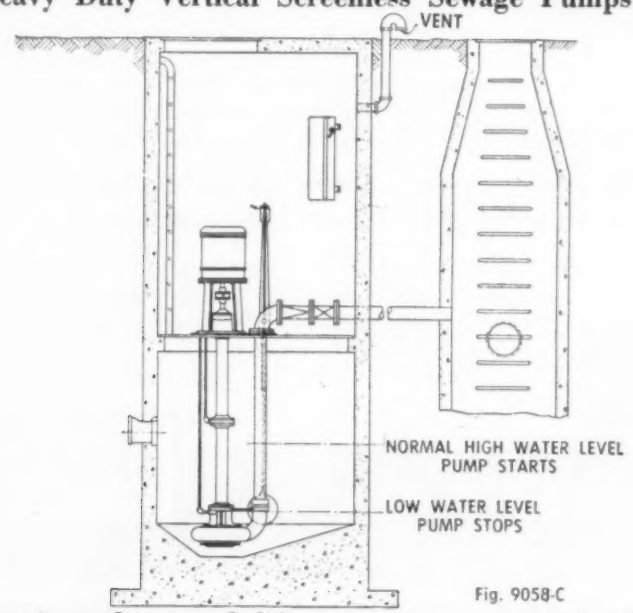

Fig. 9058-C

Automatic underground lift stations are required when sewage or waste from a group of industrial buildings or residences cannot drain by gravity into the main trunk sewer or treatment plant. An economical installation is this submerged style ejector operating in a wet pit. The motor and electrical controls are mounted above the pump cover. Either single or duplex pumps may be used. Provision for increased loads can be made by installing a single pump in a pit of sufficient capacity to allow addition of a second pump at a later period. Pumps can be supplied with totally enclosed or explosion proof motors and moisture proof or explosion proof control where conditions require.

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Fig. C-9001

Send for Bulletin C-900. Special engineering data and requirements for underground lift stations will be supplied upon request.

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4. Snow equipment: 3 Walter snowplows—two double as sanders; 3 Sno-gos; 1 Bros rotary; 1 bulldozer; and 1 shovel loader.

In addition, there are three fire trucks and two police cars, all radio-equipped, and two operations station wagons.

Electrical Maintenance

Twenty years ago, Newark Airport had but 15 to 20 KW at its command. Today it has a power supply which can deliver a 2,000 KW load at any one instant. Power and lighting are indispensable to the operation of today's modern commercial airport. All currents are supplied for the various types of lighting at Newark: Neon—outside; fluorescent; cold cathode; incandescent — interior; seal-beam — outdoor; regular incandescent with reflector-type floodlights; and mercury vapor—street lighting, both corrected and uncorrected for color.

The Port Authority maintains all lighting at the Passenger Terminal, the Air Mail and Express Building, the fire house, the warehouse, the carpenter, plumbing and electrical shops; almost all multiple-tenanted buildings; airport roads, ramp and parking lot lighting (13 forty-foot towers); and taxiways, runway identification markers, and obstruction lights on various buildings.

In connection with the Instrument Runway, which has high intensity lights every 100 feet (the usual spacing is 200 feet), there are two sources of power, independent of each other. Switch house regulators control the current and each runway light has its own transformer.

Operation of the runway lights (white and yellow), and taxiway lights (blue), as well as the Instrument Landing System, Precision Approach Radar and centerline approach lights (installed by the CAA) is controlled by the CAA in the control tower. These aids to landing require a total of 255 miles of single conductor wire. Lighting intensity, with a range of up to 200 watt maximum, is also remotely controlled.

As Newark Airport's air traffic expands, so must its facilities. Upcoming construction projects scheduled include the paving of sixteen additional aircraft parking positions; widening of an aircraft hangar apron from 300 to 400 feet; and construction of a new 800-foot-long, 75-foot-wide taxiway.

A progressive landlord, the Port Authority is never without some good plan for improving its property for the convenience of its tenants and the public.

Piling for Bridges

(*Continued from page 82*)

ton Roads Tunnel, 54-in. diameter Raymond cylinder piles were used where the water was considered too deep for the 24-in. square prestressed precast piles. These cylindrical piles, with a wall thickness of 5 ins. were precast generally in 16-foot lengths and then assembled end to end in sufficient numbers to provide the necessary length. They were then prestressed by a post tensioning method with cables threaded through holes provided during the original casting. These piles were driven with a special hammer developed for the purpose by the Raymond Concrete Pile Company.

Steel H- Piles are used quite frequently in Virginia when we expect to reach rock at a level which is too far below ground to excavate economically for a regular foundation yet not sufficiently deep to guarantee that a pile would act as a friction pile before reaching rock. They are widely used as a foundation for abutments which consist of a simple concrete cap and backwall. They are generally driven to refusal and the use of a pile driving formula for reference is not indicated; however, on some occasions in limestone formations they may be driven to considerable depth in mud seams. In this case their capacity would be indicated in accordance with the same pile driving formula used for timber piles.

We have found it possible, on almost all of our work, to standardize by using the 10-in., 42 lb. steel H-pile. This is quite helpful in permitting our Contractors and steel supply companies to stock piles in anticipation of our needs. We do not make any modification for a driving tip on these piles nor do we use any type of plate at the top where they are encased in a concrete cap. We prefer to drive these steel piles without splicing but when necessary we make provision for a butt welded splice.

As indicated earlier in this article, our timber piles are normally driven to a bearing capacity of 20 tons. Cast-in-place piles are driven to a capacity of 40 tons for 14-in. diameter piles, while we figure 12-in. piles for 35 tons and 16-in. piles for 45 tons. We normally drive precast concrete piles to a capacity approximately equal to one-half ton per inch of perimeter, using 50 tons for a 24-in. square pile and 40 tons for a 20-in. square pile. However, on the approach bridges to the Hampton

A grain elevator gets a good going over, *INSIDE, OUTSIDE!*

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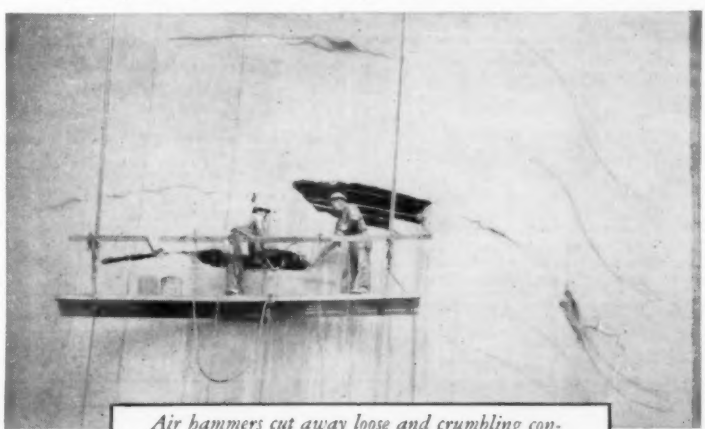

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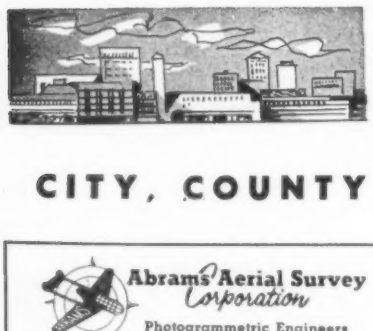

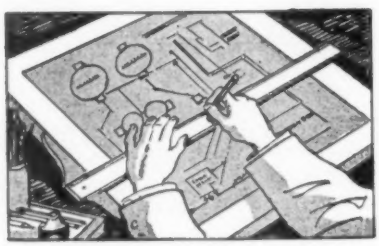

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Field Investigations

Prior to specifying the type of pile to be used, we make field investigations to determine the type of material in which the pile will be driven. Where the size of the job is sufficient to justify the cost, complete foundation borings are made and test piles are driven. If the cost of a complete investigation cannot be economically justified we either make borings or drive test piles. On small jobs we base our design on the best information available from previous work done in the vicinity. We have found generally that test piles are far better for our purposes than borings alone as we have not been successful in correlating lengths of piles, as driven, with foundation borings, except in certain special cases in Tidewater structures.

Our specifications generally permit piles to be driven with a gravity hammer, a steam hammer or a combination of water jets or hammer. A steam hammer is preferred. Precast concrete piles are preferably driven by means of hammer and jet.

Gravity hammers for driving steel and timber plates are required to weigh not less than 2,000 lbs. and preferably not less than 3,000 lbs. The fall must be so regulated to avoid injury to the pile and in no case shall it exceed 20 feet. When a steam hammer is used the total energy developed by the hammer must be not less than 6,000 ft. pounds per blow.

We generally require that precast concrete piles or shells for cast-in-place piles are to be driven with a steam hammer which must develop not less than one foot pound per blow at each stroke of the piston for each pound of weight driven. In no case is the total energy developed by the hammer to be less than 6,000 ft. pounds per blow.

When water jets are used we require that the number of jets and the volume and pressure of water at the jet nozzle shall be sufficient to erode freely the material adjacent to the pile. The plant must have sufficient capacity to deliver at all times at least 100 lbs. per square inch pressure at two ¾-in. jet noz-

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zles. We also require that before the desired penetration is reached the jets shall be withdrawn and the piles driven with the hammer to secure final penetration. This final driving must be from three to five feet after removing the jets.

Gravity hammers when used generally weigh 2500 to 3000 lbs. though occasionally slightly lighter hammers are used. The steam hammers most widely used for timber and steel piles and for cast-in-place pile shells are the McKiernan-Terry 9-B- 3, developing an energy blow of 8750 ft. pounds, and the 10-B-3 with 13,100 ft. pounds per blow. The Vulcan No. 2 Hammer developing 8000 ft.-pounds per blow with a 32-in. stroke has also been used on a number of jobs. The hammer most widely used for driving precast concrete piles is the McKiernan-Terry S-8 single-acting hammer, developing an energy per blow of 26,000 foot-pounds. The Vulcan No. O hammer, developing an energy per blow of approximately 30,000 foot-pounds, is used by some of our contractors.

In addition to the foundation piles which have been discussed above, we frequently use timber piles for fender systems in connection with our movable span bridges. For these we specify either that they be driven to a 15-ton capacity or to a certain minimum penetration. We also are called upon to drive piles for ferry slips in connection with State operated ferries across navigable streams. Creosoted piles are used for both of these purposes, except that in ferry slips those piles which are subject to abrasion from direct contact with the ferry boats are usually of untreated white oak driven as soon as practicable after the piles have been cut.

Use of piles for foundation of bridges in Virginia continues year by year on a fairly large scale. We are constantly seeking improved methods and better materials in connection with this work. We are attempting to keep abreast of the latest information available both with respect to improved pile formulas and means of correlating soil information obtained from borings with length and capacity of piles as driven.

• • •

Germany Claims to Have Rat-Free Port

A rat control program put on by the city of Cuxhaven, West Germany, is reported to have made that city rat-free. Control teams worked over a 3-month period, utilizing warfarin and killing an estimated million rats.

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PUBLIC WORKS

EQUIPMENT NEWS

Published Monthly November, 1956

Centri-Mite BF Series Pool and Water Filters

A diatomaceous earth type filter has been announced by Swimquip. Its vertical tank incorporates two features: A built-in turbo-jet backwashing arrangement, using less than 1/3 the normal amount of water for cleaning its elements; and a baked-on plastic coating inside. The largest of the BF series measures only 36 ins. in diameter by 6 ft. 6 ins. high. Its flow rate is 343 gallons per minute. Backwashing is effective through a two-phase cycle and the customary reversed flow is used first, then, the turbo-jet washes down filter elements with a rotating stream of water. The plastic coating inhibits electrolysis or chemical corrosion in the tank. Intermediate sizes, down to a 20-inch diameter model, filtering 83 gallons

Diatomaceous earth type water filter

of water per minute, are also available. These filters can be used in commercial swimming pools, municipal water supplies and industrial plants. For additional information and prices write to Swimquip, Inc., 3301 Gilman Road, El Monte, Calif., or circle **No. 11-1** on the reply card.

John Deere crawler with trencher and dozer working on a sewer line project

New Time-Saving Features for Industrial Tractors

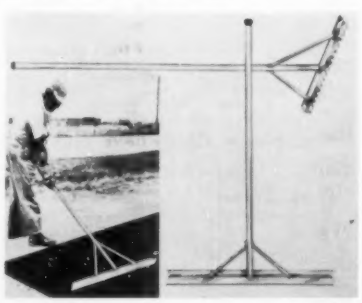
A direction reverser that permits forward or backward travel at the same speed without shifting gears is an optional feature for John Deere industrial "420" crawler and utility tractors. This is a time-saving feature when dozing, digging, and handling loading operations, especially in tight quarters. Another optional feature for the same model tractors is the easy-to-attach foot throttle which increases engine and ground-travel speeds up to 25 percent, making possible travel speeds (with wheel-type tractors) up to 17 mph on the highway. For increased versatility in many operations a 5-speed transmission is offered for all models of industrial tractors. Continuous-running PTO is another optional feature available. It provides continuous operation, when the tractor is stopped, of such equipment as rotary mowers and cement mixers. For full details write John Deere Industrial Div., Moline, Ill., or circle **No. 11-2** on the reply card.

Single Port Impeller Sewage Pumps

A series of sewage pumps with the so called "bladeless" or single port impellers have been introduced by Pacific Pumping Co. Single port impellers resist clogging with long fibres or stringy materials. Also, having only a single port, their capacities in terms of GPM are small enough to make it possible for them to handle normal sewage solids in small quantities on less hp. These sewage pumps range in capacities from minimum up to approximately 2300 GPM, both in wet pit and dry pit construction. For further details write Pacific Pumping Co., 9201 San Leandro St., Oakland 3, Calif., or circle **No. 11-3** on the reply card.

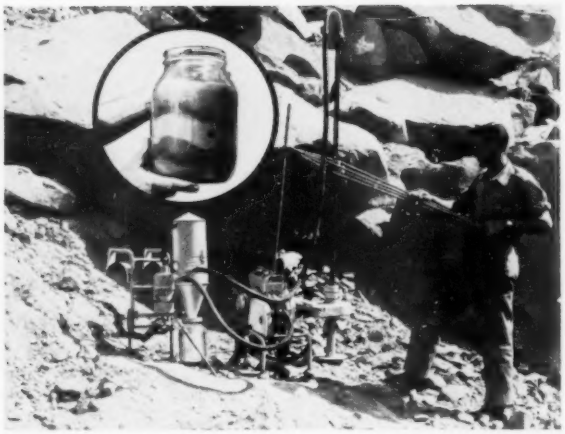
Combination Asphalt Lute and Rake

An all-aluminum asphalt Lute-O-Rake has been announced by Miller Spreader. The new product is a light-weight combination of both lute and rake. One edge of the T shaped extruded aluminum blade is straight while the other has teeth like a rake. (Two models are available: one with both blade edges straight for luting, another with one plain edge and one rake edge.) Handles come in two easy-working lengths: 7 and 10-ft. lengths. Blades are offered in 30 and 36-in. widths. The Lute-O-Rake blade moves both hot and cold mixes easier and cleans faster. The deep-cut rake teeth are designed to move all sizes of asphalt mixtures more uniformly. For more information write The Miller Spreader Corp., 4020 Simon Road, Youngstown, Ohio, or circle **No. 11-4** on the reply card.



All-aluminum Lute-O-Rake for leveling all types of black-top materials

Sludge tank of this sewer line emptier holds 300 gallons



Drill is used for soil sampling and locating water strata

Septic Tank and Sewer Line Cleaner

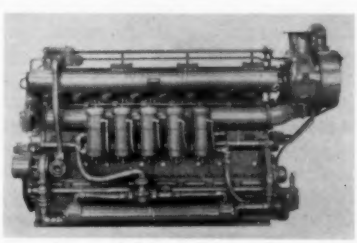
A truck-mounted sewer and cesspool emptier has been introduced by City Tank. The "Karrier-Yorkshire" operates on the "piston compression and discharge" principle removing sludge and water quickly and economically. The sewer or cesspool contents are drawn into the unit's sludge compartment until the tank is full. At this point, a hydraulic ram moves a pusher plate to the rear of the tank, forcing the dirty water into a surplus water compartment and compressing the solid sludge against the rear door of the tank. The dirty water, but not the sludge is then returned to the sewer and the process repeated until the tank is full of solids. The sludge tank will hold over 300 gallons of compacted sludge. A float valve automatically closes the suction valve when the 50-gal. surplus water compartment is full. The suction hose works by means of a crane which turns through 360 degrees and enables the operator to clean sewers from either side of the street or from the front or back of the truck. The entire unit can be mounted on any standard truck chassis. For more details write Paul Brown, Sales Manager, City Tank Corp., 53-09K 97th Place, Corona 68, N. Y., or circle **No. 11-5** on card.

Foamwilt Solves Sewage Foam Problem

For economical and uniform control of foam in sewage aerators, Fine Organics offers a product that not only kills off foam but inhibits its formation. Foamwilt is fed with a suitable pump into the aerator at 0.5 to 1 ppm. It has excellent spreading ability and good "knockdown" of foam in any season or temperature. It will not separate and shows little change in viscosity in temperatures of 0° to 100° F, assuring the user that pipes and valves will remain free flowing. For further information write Fine Organics, Inc., 211 East Nineteenth Street, New York 3, N. Y., or circle **No. 11-6** on the card.

Diesel Engines For Standby Power

An improved series of industrial diesel engines which can operate exclusively on low-cost fuel has been developed with ratings to 1,025 hp by White Diesel. The Model 40 Superior diesel engines are designed for use in heavy equipment like power shovels, as standby power for industrial plants and telephone companies and mobile power for utilities. Portable engine generator sets range to 600 KW capacity. The new heavy-duty models are built as four-cycle, six or eight cylinder, vertical, in-line engines but they provide power equal to other engines with more cylinders. Output of the engines ranges from 215 to 1,025 hp. The latter represents nearly a 50 percent increase over a top capacity of 700 hp in the previous line. For full details write White Diesel Engine Div., White Motor Co., Springfield, Ohio, or check **No. 11-7** on the reply card.

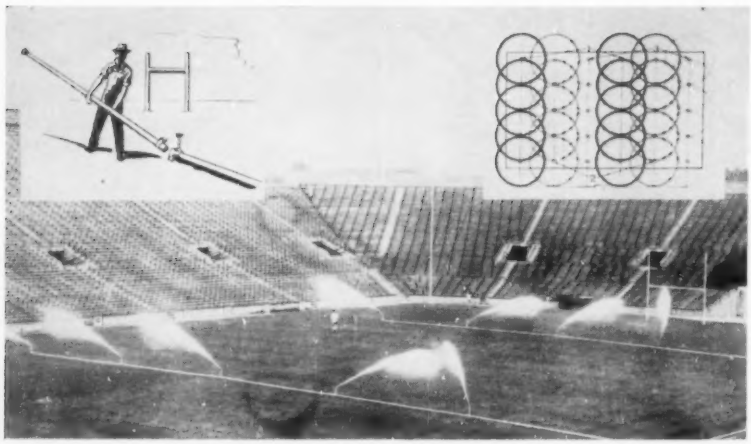


Portable Vacuum Drill Uses No Water

A compact, portable rotary drilling system weighing only 125 lbs. which removes all cuttings from the hole by vacuum has been developed by Houston Tool. Known as the Mighty Midget, the gasoline powered rig is easily carried by two men, facilitating use in rough terrain impossible to reach by truck or car. The unit is quickly set up and the rotary table can be swiveled to drill at any angle, vertical or horizontal. High velocity air cools the bit and lifts the cuttings internally through the drill stem. The unit drills a 1¾-in. hole up to 100 feet deep in dry formation and utilizes a 9 hp McCulloch engine. Among its many applications are shot and blast hole operations, location of water strata, evaluation of underground deposits, geophysical work and earth sampling. For full details write Houston Tool Co., Santa Susana, Calif., or circle **No. 11-8** on the reply card.

"Free Flowing" Reflective Glass Bead Dispenser

A useful reflective glass bead dispenser for municipal and highway paint striping is announced by Flex-O-Lite. The unit is suitable for attachment to any traffic line paint machine and dispenses beads in any desired quantity and rate. Automatic or manually operated, it is made of cast aluminum and is 4 inches wide. For complete information on specifications and prices write Flex-O-Lite Mfg. Corp., 8301 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo., or circle **No. 11-9** on the reply card.



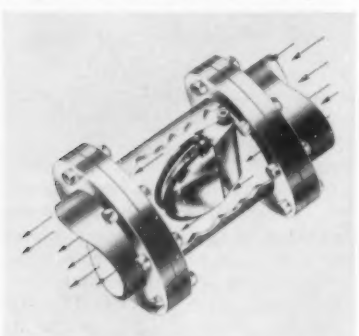
Large lawn areas may have thorough soaking and watering by this sprinkler

Packaged Irrigation System Permits Fast Sprinkling

Thorough soaking and effective systematic coverage of large lawn areas is now possible with Shur-Rane packaged irrigation system developed by John Bean. It is available as a packaged unit that will easily cover an area of 60 x 120 yards with only three positionings of the sprinklers. Featured are the use of a large-capacity, 2-inch diameter aluminum pipe for supply and sprinkler lines. The system consists of six 30 foot lengths of supply line, ten 30-foot lengths of sprinkler line, ten integral sprinkler heads, and all necessary fittings and connectors. These heads will cover an area of more than 300 square yards during each revolution, applying 0.4 inch of water per hour at a rate of 70 gpm. The sprinklers are designed to operate at 40 pounds pressure. Water for the system can be obtained from a standard hydrant or any 2-inch water supply line. Complete details from John Bean Division, Food Machinery and Chemical Corp., Lansing 4, Mich., or circle **No. 11-10** on the reply card.

Plastic Check Valve For PVC Piping Systems

A new check valve made of polyvinyl chloride for handling corrosive gases, vapors and fluids has been developed and introduced by Techno Corporation, and is called Technocheck-PVC. The valve can be used in all PVC systems, and temperature and pressure limitations are the same as those for PVC. Bodies are fabricated of tubing and flanges meeting ASA Standards. Internal parts are of PVC, with sealing members of plasticized PVC, Neoprene, or Buna N, all reinforced with nylon for high strength. The valve is available in standard sizes from 1 to 8 inches; male threaded ends in sizes from 1 to 4 inches; or with standard flanges or socket ends. Further information is available from the Techno Corp., 16 West 5th St., Erie, Pa. or circle **No. 11-11** on the reply card.



Unique check valves are available in standard sizes from one to eight ins.

Smooth Reflective Signs by Cataphote

Perfectly smooth, beaded reflectorized signs are now available at low cost as a result of a new process developed by Cataphote. The perfectly smooth surface makes the signs exceptionally dirtproof and weather resistant. Utilizing ultra high reflective index beads with wide angularity, the new process provides more effective reflectorization under adverse weather conditions. The recently adopted U. S. standard white on red STOP signs present a bright red by day and are unusually brilliant when reflected at night. They are available in the standard 24 x 24-in. size or the 30 x 30-in. size. The company also plans to use the new process for reflectorizing green and white information signs such as used on the new turnpikes and freeways. For full details write Cataphote Corp., Toledo, Ohio, or check **No. 11-12** on the reply card.

Motor Graders With Torque Converters and Diesel Power

Cummins diesel powered 6-D and 7-D series motor graders with torque converter and full power shift transmission have been announced by Huber-Waco. The new models are the 6-D2, powered by a 125-hp Cummins, and the 7-D2, powered by a 150-hp Cummins diesel. Standard on both grader models is a power sliding moldboard, operated hydraulically from the cab. Complete hydraulic control of every working position—entirely governed from the cab—is another important feature. The operator can attain a high bank-sloping angle, up to 90 degrees on either side, without leaving the cab. The blade can be rotated 180 degrees without removing the scarifier teeth. For complete details on the 6-D2 and 7-D2 write Huber-Warco Company, Marion, Ohio, or circle **No. 11-13** on the reply card.

Higher Lift For Michigan Tractor Shovels

Gondolas and high sided trucks can now be loaded directly by Michigan tractor shovels fitted with a new high-lift bucket. This attachment increases the dumping height of the bucket by 43 ins. It raises the lower edge of the bucket to 12-ft., 1-in. Complete details of the attachment can be obtained from Clark Equipment Co., Construction Machinery Division, Pipestone Road, Benton Harbor, Mich., or circle **No. 11-14** on the reply card.

Dumping height of the Michigan tractor shovel is increased 3 feet 7 ins.

Hand Gun For Air Blast Application of Fertilizer

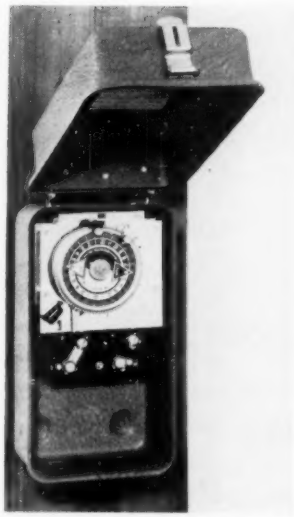
The "Ferti-Blast Gun," a specially designed and built portable hand gun for air-blast application of pelleted (granular) fertilizer, grass seed and limestone, has been announced by Chowning Regulator. The gun works directly from an air compressor usually towed behind the truck carrying the bags of material. No previous experience is required of the operator; no restriction is imposed by need of water supply; distribution of material is even, and easily controlled; coverage is up to 75 feet, even up steeply

Portable hand gun for application of fertilizer, grass seed and limestone

sloping banks and in high winds. Approximately 25 lbs. of granular fertilizer per gun, per minute, is normal and two guns can be operated simultaneously from a single compressor. The gun can be used by highway departments, and for park and golf course maintenance operations. For complete details write Chowning Regulator Corp., Corning, N. Y., or circle **No. 11-15** on the reply card.

Weatherproof Outdoor Time Switches

A new weatherproof outdoor time switch designed with up to eight on-off operations in a 24-hour period, has been introduced for industrial use, parking areas, playgrounds, parks and signs, by Paragon Electric. The heavy-gauge steel case is gasketed for dust resistance, zinc plated, and finished in baked gray wrinkle enamel for maximum weather resistance. Each switch in the series features a heavy-duty, low-temperature motor of special design for extreme outdoor temperature variations. Operations may be readily set for temporary or seasonal lighting, as close as 90 minutes apart on the 24-hour dial. Four 60-cycle, 30-amp models are available for 120 or 240-volt operation with either a single-pole, single-throw

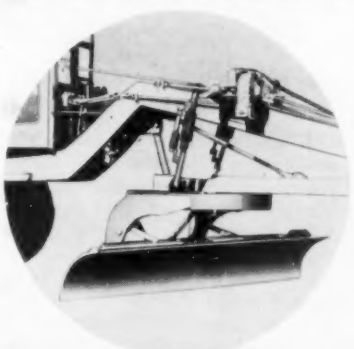


Switches will operate at temperatures below zero degrees F

switch for two-wire lines, or a double-pull, single-throw switch for three-wire lines. The new UL approved Series 3300 outdoor time switches may be pole or surface mounted. For full information write Paragon Electric Co., Two Rivers, Wisc., or circle **No. 11-16** on the reply card.

Moldboard Shocks For Motor Graders

Easily installed moldboard shocks for most all graders have been announced by Over-Lowe Co. These shocks enable graders to maintain roads at 12 to 15 mph, plow snow off gravel and hard surfaced roads without damaging road surfaces. Wear and tear on blades are reduced and tires last longer. When rigidity is required, as in backsloping, replacing the lock pins in the mold board shocks make them completely rigid. For further information write Over-Lowe Co., P. O. Box 2876, Denver 1, Colo., or circle **No. 11-17** on the reply card.



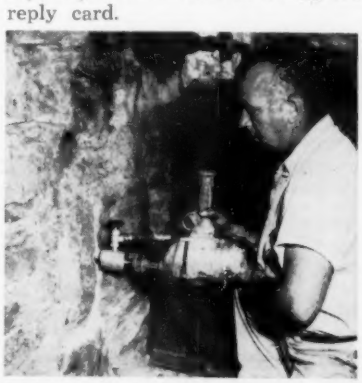
Moldboard shocks will fit most graders

Fog Dispersing Equipment Aids Traffic Safety

Pockets of ground fog which create a traffic hazard in many areas usually can be dispersed by a very slight rise in air temperatures. Since a layer of warmer air about 150 feet above the ground generally overlies the fog location, makers of the "Fog-Master" use a vertically mounted propeller which draws the warm air down and spreads it horizontally over a large circular diffuser. Effective throughout a 600-ft. radius, the unit has a specially designed propeller driven by a 25-hp electric motor and moves 130,000 cubic feet of air per minute. Electronic controls are available for fully automatic operation. To get complete data from the manufacturer, Diesel Power, Inc., Box 72, Greenville, Pa., circle **No. 11-18** on the reply card.

Horizontal Earth Boring Auger

The new Hydrozion auger hand tool is of interest to sewer contractors, municipal and highway departments and others whose earth boring requirements range from one to eight inches in diameter. Designed to eliminate digging up lawns and parkways and breaking up streets and intersections, the unit will drill up to 100 feet through dirt, hard pan, clay, sandy loam, shale, gravel and roots. The direction of drilling can be up, down, horizontally or at any angle. Boring is at a rate up to 10 feet a minute. The auger is relatively simple and extremely easy to operate and consists of a driving unit and a bit. For more information write Hydrozion Engineering Co., Inc., 2003 Indiana Ave., Kansas City 27, Mo., or circle **No. 11-19** on the reply card.



Earth boring tool drills through soil 10 ft. per min. and laterally 100 feet

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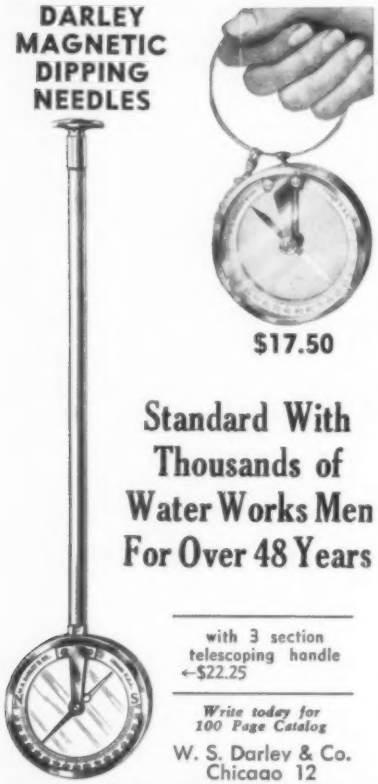

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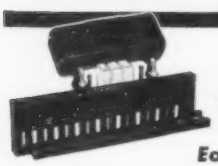

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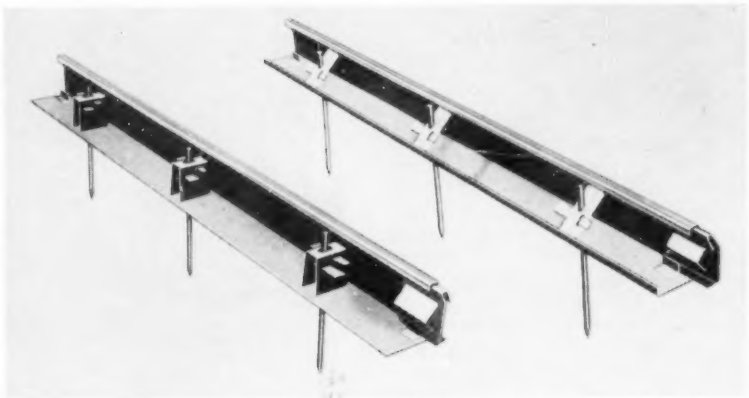

Highway construction forms are available in single and double wedge lock types

Road, Curb and Sidewalk Forms

A new line of general purpose road forms, designed for fast handling, durability, and low cost, is announced by General Road Machines. Available in both single and double wedge lock types, the road forms feature special alloy steel construction. Tapered sliding lock joint connections are stated to assure quick, positive alignment. Lock-joint connections also reinforce form treads at joints and prevent tread distortion, even under the heavy loads imposed by modern road building machinery. Many types and sizes of forms are carried in stock or General will design and build special forms to meet special requirements. For further information, write General Road Machines, Inc., Niles, Ohio, or circle **No. 11-20** on the reply card.

Four-Wheel Drive "Payloader" Tractor-Shovels

Two new four-wheel drive, pneumatic-tired "Payloader" tractor-shovels have been announced by Hough. These are the model HH with a capacity of 1¾ cu. yds. and the model HU with a capacity of 1½ cu. yds. Numerous new features have been incorporated in the design of both of these new units including the new Hough-designed and manufactured "Paylomatic" power-shift transmission. The new transmission eliminates stopping and all shifts in both forward and reverse can be made without even slowing down. The torque-converter gives infinite speed ratios for maximum performance. Boom-arm design which permits "pry-out" of the load and the bucket action which provides 40° tip-back of the load at ground level are other features. Cushioning of the load during travel cycles by means of a hydraulic system load-shock-absorber is said to permit faster movement of material over rough terrain with less spillage. Complete specifications are available. The Frank G. Hough Co., 761 Seventh Avenue, Libertyville, Ill., or circle **No. 11-21** on the reply card.

Transistorized Leak Detector

Detection of hidden leaks in water lines is made easier with a new transistorized M-Scope leak de-

Leak detector weighs only seven lbs.

tector. Use of five miniature hermetically sealed transistors makes it possible to provide several times more amplification of the leak sounds than in previous models. At the same time weight, size and battery requirements are greatly reduced so that the new leak detector is truly a portable instrument. The weight is only seven pounds complete and size is 9 x 9 x 5 inches. Use of transistors completely eliminates the problem of microphonic tubes, drastically reduces battery drain and makes possible a more rugged and compact unit. A built-in battery test circuit is included for even easier maintenance. For further information write Fisher Research Laboratory, Inc., Palo Alto, Calif., or circle **No. 11-22** on the reply card.

Hydraulic Scoop of 1½ Yds. Capacity Works Behind Any Tractor

The Tumaco scoop is available for tractors with hydraulic systems, or comes with its own hydraulic system. The scoop hauls up

Scoop for hydraulic-equipped tractors also comes with own hydraulic system

to 1½ yards of dirt per load and is capable of digging, dumping and leveling in one continuous operation. The twin hydraulic cylinders are double-acting and this provides practical control and digging power at all times, no matter how hard or soft the ground. When scooping, the blade and bucket design "boils" the dirt into the bucket to prevent wedging and clogging. The unit is equipped with a 5-ft. replaceable cutting edge and 2 sets of dump locks, one for cutting and loading, the other for spreading and leveling. When equipped with the auxiliary bank shaving blades the scooop converts to a trench digger with a 76-inch cut. Additional details from Tumaco Equipment, 910 East Main, Marion, Kansas, or circle **No. 11-23** on the reply card.

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Care of Public Works Magazine

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Thousands of progressive engineers are finding that our readers' service section is the easy, handy way to obtain new catalogs of advertised products. Be sure and return the postage free reply card inside front cover for your catalogs.

SEE PAGES 32 TO 50

SANITARY ENGINEERS

Pennsylvania Department of Health

SANITARY ENGINEER VI - $9,454 - $12,075. As Director administers a comprehensive state-wide program of sanitary engineering, involving water supplies, sewerage and sewage treatment, industrial waste treatment and mine drainage. Requirements: Eight years of responsible professional experience, including three years in an administrative capacity: B. S. in engineering and M. P. H.

SANITARY ENGINEER V - $8,163 - $10,432. Serves as Assistant to the Director. Directs and coordinates the sanitary engineering program on a state-wide and regional basis. Requirements: Six years of responsible professional experience, including two years in an administrative capacity: B. S. in engineering and M. P. H.

SANITARY ENGINEER IV - $7,055 - $9,011. As Regional Sanitary Engineer, to direct activities in the fields of water supply, sewerage and sewage disposal, and industrial waste treatment. As chief, Sewerage section, to plan and coordinate the state-wide program of public sewerage and sewerage treatment. Requirements: Four years of responsible professional experience, including one year in the field of specialization and one year in a supervisory capacity: B. S. in engineering and M. P. H.

SANITARY ENGINEER III - $6,090 - $7,772. As assistant Regional Engineer or Assistant Section Chief, to assist in directing the sanitary engineering program at the central office of regional level. Requirements: Three years of responsible professional experience; B. S. in engineering.

SANITARIANS

Pennsylvania Department of Health

SANITARIAN V - $7,407 - $9,454. Assistant Director. Serves as Assistant to the Director of the Division of Sanitation. Directs and executes Pennsylvania's environmental sanitation program in the fields of food sanitation, camps and schools, vector control, and individual water supplies and sewage disposal facilities. Requirements: Five years of responsible professional experience, including two years in an administrative capacity: B. S. in engineering or the biological sciences and M. P. H.

SANITARIAN V - $7,407 - $9,454. Director, Division of Environmental Safety. To administer a state-wide program of environmental safety in the fields of housing and accident prevention. Requirements: Five years of responsible experience in environmental sanitation, including two years in environmental safety work and two years in an administrative capacity: B. S. in engineering or the biological sciences and M. P. H.

SANITARIAN IV - $6,390 - $8,163. As chief of the Food Sanitation Section, Vector Control Section, Accident Prevention Section, or Housing Section, to direct state-wide programs in these fields. Four years of responsible professional experience, including one year in the field of specialization and one year in an administrative capacity: B. S. in biological sciences or engineering.

SANITARIAN III - $5,529 - $7,055. To direct a state-wide program in Camp and School sanitation. Requirements: Three years of experience in public health environmental sanitation: B. S. in biological sciences or engineering.

SANITARIAN II - $4,773 - $6,090. District Supervising Sanitarian or Assistant Regional Sanitarian in the Division of Sanitation. Requirements: One year of experience in public health environmental sanitation: B. S. in biological science or other field closely related to environmental sanitation.

Excellent state retirement plan and merit system. Opportunity for training and advancement. For applications or further information please write not later than November 23, 1956.

Mr. Andrew L. McCabe
Director of Personnel
Pennsylvania Department of Health
Post Office Box #90
South Office Building
Harrisburg, Pennsylvania

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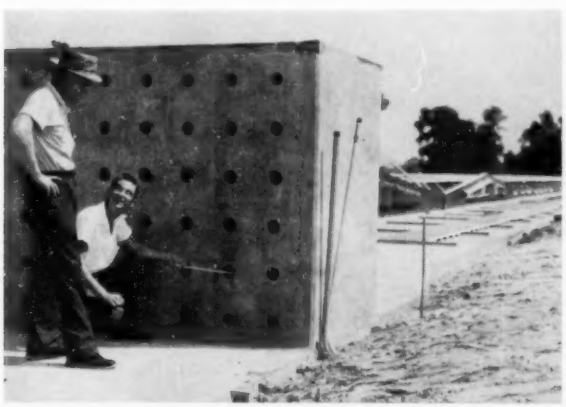
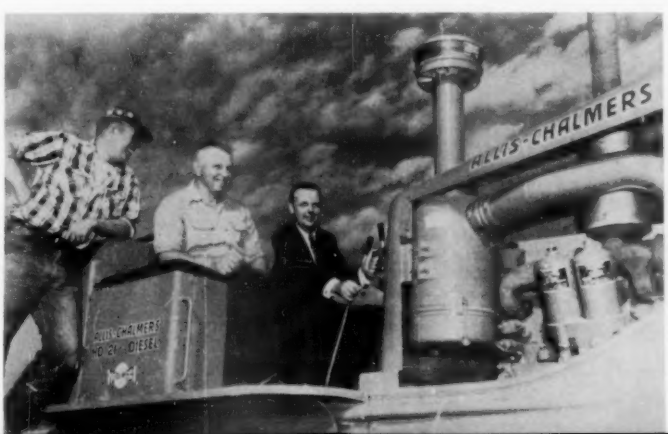
—Worth Seeing

With winter coming on, here is a preview of the Wollman Memorial rink in Central Park, New York City, designed in 1944 by M. R. Carpenter and completed in 1950. The monolithic floating floor and piping system provides nearly 30,000 sq. ft. of skating area for a crowded 2,500 at one time. In the warm months, the rink is used for playground and dancing.

With the new aluminum-clad Prudential Building in Chicago for a background, we present a pair of the 6,000 new Alcoa street signs with light-reflecting Scotchlite letters which are easily located and read by day or by night.



Officers of Prestressed Concrete, Inc.. at Lakeland, Fla., Floyd L. Furnell and Tom Moore, are shown in front of one of the new prestressing walls—first of their kind—used in their new prestressed concrete manufacturing plant. The walls or abutments here have the greatest capacity of any abutments in existence today, being able to withstand a total horizontal force 2,000,000 lbs. The new plant is capable of turning out prestressed concrete beams which will cover clear spans up to 125 feet.



Governor William G. Stratton of Illinois can now run a tractor as well as a state! Here he is shown learning his driving on the first 4.77-mile segment of a "trumpet" traffic interchange, part of the Chicago-Rockford-South Beloit toll road which will join Chicago's extended expressway systems.

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

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WORTH TELLING

by Arthur K. Akers

★ LIFE would be wonderful if only we could accept all of our invitations! Latest regret, the John Deere Co. Atlanta Branch tractor and equipment show, Oct. 4.

★ R. S. (STEVE) RANKIN, long director of the Sanitary Technical Division of Dorr-Oliver, Inc., retired on October 1—if that word can be used in connection with one so young in heart. He will continue, however, in a consulting capacity and as representative of his firm in various organizations.

★ NATIONAL LIME ASSOCIATION, Washington, announces that Kenneth A. Gutschick has joined it as manager of technical service and general assistant to General Manager Robert S. Boynton.

★ JAMES G. MORRIS and C. FRANK RIDDLE, respectively, are named product managers for Century material spreaders and for Pulvi-Loader divisions, Seaman-Andwall Corp., Milwaukee.

★ HOMELITE plans a new factory building in Gastonia, N. C. to produce its gasoline-powered chain saws: not to give them a Southern accent but to turn out more chain saws.

★ HERE are James G. Dean (right), new vice president and assistant to the President, Wagner Iron Works, Milwaukee; and William J. Schlapman, new vice president, sales, pictured with a Wagner utility dozer.

New Wagner Iron Works officials

★ MICHAEL E. CONWAY, advertising manager, Enterprise Engine Division, San Francisco, adds the duties of public relations director for the parent company, General Metals. Soon Mike will be wearing different coats just to keep track of himself.

★ J. I. CASE CO. and AMERICAN TRACTOR CO., by vote of their respective Boards, will merge; to give Case a broad entry into the road-

Mr. Rojtman

Mr. Brown

building field, according to a press release just received. John T. Brown is president of Case, Marc B. Rojtman of American.

★ JOHN KNOTT Jr. is now sales manager, J. H. Holan Corp., Cleveland, manufacturers of utility truck bodies.

★ PORTLAND CEMENT ASSOCIATION announces new offices in Los Angeles, Seattle, Baltimore, Trenton, Portland (Maine), and Louisville to improve their service to cement users.

★ DRESSER MFG. DIVISION plans a new million-dollar plant in Wellsboro, Pa., to manufacture compression fittings.

★ DONN BROS is appointed assistant sales manager, Wm. Bros Boiler & Mfg. Co., Milwaukee.

★ ALLIS-CHALMERS announces W. J. Klein as vice president and director of sales; W. L. Voegeli as general sales manager, Tractor Group.

★ One of our young publicity friends writes that he has become so bold and independent that he can look the president of his company right in the eye and say *"Yes, Sir."*

For Houston's new 50 mgd plant . . .

Freese, Nichols & Turner, Consulting Engineers, specified the most modern, master filter control system.

This system, for the City of Houston's recently completed $5,000,000 modern water purification plant that is now in service, must deliver top filter performance: maintain exact total flow despite changes in head in 8 filters; precisely measure flow rate, head loss; carefully control wash rates to protect beds; transmit all vital data to *one central control point*—with no lag, no hunting, no inaccuracies.

To meet these rigid requirements, Simplex flow controllers and instrumentation were selected. For dependable pipe-gallery operation, Simplex Laminair® units *pneumatically* transmit data to operating tables. For complete control of all the wide spread operating elements, Simplex Orthoflow® units *electrically* transmit data to one central point—instantly, accurately.

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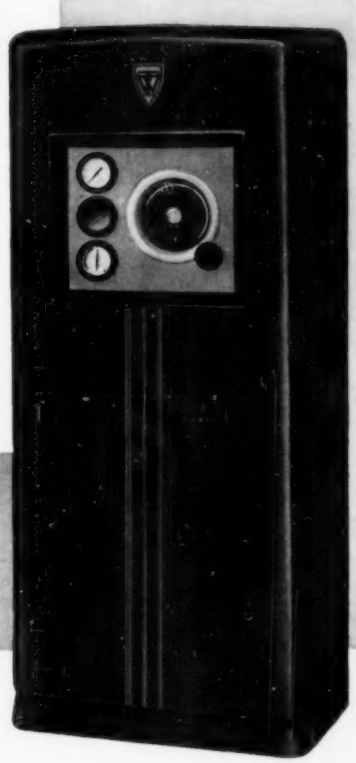
A-711 V-notch Chlorinator has rotameter indicator with 10 to 1 feed range



A-712 V-notch Chlorinator has dial indicator with 20 to 1 feed range

NEW *V-notch Chlorinators* SIMPLIFY *Chlorination*

With the new Wallace & Tiernan V-notch Variable-Orifice Chlorinators:

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